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Final Response to BDAT Related Comments Document D007 Characteristic Wastes for Chromium. Volume 1-G

(U.S.) Environmental Protection Agency, Washington, DC

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This response to comments document only addresses those comments which were submitted on the proposed land disposal restrictions for those waste codes and general BDAT technologies and issues which relate to Third Third Wastes Treatment Standards.

The commenters presented in this document are grouped according to major concerns of the commenters.

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FINAL
RESPONSE TO BDAT RELATED COMMENTS DOCUMENT

D007: Characteristic Wastes for Chromium

VOLUME I-G

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May 1990

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INTRODUCTION

This response to comments document only addresses those comments which were submitted on the proposed land disposal restrictions for those waste codes and general BDAT technologies and issues which relate to Third Third Wastes Treatment Standards.

The commenters presented in this document are grouped according to major concerns of the commenters. This document is comprised of the following sections:

ISSUE CODE 1: General BDAT Aspects
ISSUE CODE 2: D001 - Characteristic Ignitable Wastes
ISSUE CODE 3: D002 - Characteristic Corrosive Wastes
ISSUE CODE 4: D003 - Characteristic Reactive Wastes and P and U Wastes Containing Reactive Listing Constituents
ISSUE CODE 5: D004/D010 - Characteristic Wastes for Arsenic and Selenium and K, P, and U Wastes Containing Arsenic and Selenium
ISSUE CODE 6: D005 - Characteristic Wastes for Barium and P013
ISSUE CODE 7: D006 - Characteristic Wastes for Cadmium
ISSUE CODE 8: D007 - Characteristic Wastes for Chromium
ISSUE CODE 9: D008 - Characteristic Wastes for Lead P and U Wastes Containing Lead
ISSUE CODE 10: D009 - Characteristic Wastes for Mercury P and U Wastes Containing Mercury
ISSUE CODE 11: K044, K045, K047: Wastes from the Manufacturing and Processing of Explosives
ISSUE CODE 12: D011 - Characteristic Wastes for Silver
ISSUE CODE 13: P119, P120 - Vanadium Containing Wastes
ISSUE CODE 14: P and U Wastes Containing Thallium
ISSUE CODE 15: Mixed Radioactive Hazardous Wastes
ISSUE CODE 16: Polynuclear Aromatic U Wastes
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ISSUE CODE 24: K011/K013/K014 - Acrylonitrile

ISSUE CODE 25: K015 - Still Bottoms from Benzal Chloride

ISSUE CODE 26: K021 - Spent Antimony Catalyst.

(No Comments Were Received for this Waste Code)

ISSUE CODE 27: K046 - WW Treatment Sludges from Manufacturing, Formulating, and Loading of Lead-Based Initiating Compounds

ISSUE CODE 28: K060 - Ammonia Still Lime Sludge.

(No Comments Were Received for this Waste Code)

ISSUE CODE 29: K061 - Electric Arc Furnace Dust

ISSUE CODE 30: K069 - Emission Control Dust/Sludge from Secondary Lead Smelting

ISSUE CODE 31: K071, K106 - Mercury Cell Process Wastes

ISSUE CODE 32: K073 - Chlorinated Hydrocarbon Wastes.

(No Comments Were Received for this Waste Code)

ISSUE CODE 33: K086 - Residues from Ink Formulation

ISSUE CODE 34: K100 - Waste Leaching Solution from Acid Leaching of Emission Control Dust/Sludge from Secondary Lead Smelting

(No Comments Were Received for this Waste Code)

ISSUE CODE 35: Wastes Containing Cyanide

ISSUE CODE 36: K017 - Wastes from the production of Epichlorohydrin

(No Comments Were Received for this Waste Code)

ISSUE CODE 37: K028,K029, K095, K096 - Production of 1,1,1-Trichloroethane

ISSUE CODE 38: Wastewaters containing BDAT Constituents

ISSUE CODE 39: K022 - Wastes from the Production of Phenol/Acetone

ISSUE CODE 40: K025 - Distillation Bottoms from the Production of Nitrobenzene

ISSUE CODE 41: K035 - WW Treatment Sludges from the Production of Creosote

ISSUE CODE 42: K026 - Stripping Still Tails from the Production of Methyl Ethyl Pyridine

(No Comments Were Received for this Waste Code)

ISSUE CODE 43: K083 - Distillation Bottoms from the Production of Aniline

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(No Comments Were Received for this Waste Code)

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(No Comments Were Received for this Waste Code)

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Commenters are identified by both commenter number and commenter name. Comments within each section of this document have been assigned a sequential comment number.

Issues were obtained from the original comment submittal and were categorized based on the grouping specified above. The Agency's response to each comment follows immediately after the text of the document. For responses related to capacity issues, the reader should review the "Response to Comments Background Document for the Third Third Land Disposal Restrictions Proposed Rule, November 22, 1989. Volume II Capacity Related Comments." For information regarding broad policy questions, the reader is directed to the "Response to Comments Background Document for the Third Third Land Disposal Restrictions Proposed Rule, November 22, 1989. Volume III Policy Related Comments."

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No Comments Were Received for this Waste Code

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No Comments Were Received for this Waste Code

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ISSUE CODE 8:D007 - Characteristic Wastes for Chromium

A.-. Treatment Standards
B.-. Treatment Data
C.-. Treatability of Waste/Group
D.-. Total Chromium vs Hexavalent or Trivalent Chromium
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Comment Number: 8-A-1
Docket Number: LD12-00020
Commenter: CyanoKEM
Issue: 8- Chromium (D007)
Subissue: treatment standards
Comment:

INTRODUCTION

CyanoKEM Inc. is a Part B permitted commercial inorganic TSD facility located in Detroit, Michigan. CyanoKEM treats a wide variety of waste from the electroplating industry as well as other inorganic waste streams. CyanoKEM provided extensive data packages and comments to EPA on its process in response to the Second Thirds proposed land disposal restrictions. The docket to the Second Thirds contains extensive information on the plant process, operations procedures, and waste characterization procedures.

CyanoKEM is commenting in this paper on the EPA's proposed standards for D007 waste. We feel that the technology transfer from K062 is inappropriate since the waste matrix for what is typically found for D007 waste streams is vastly different from K062. We feel that the proposed non-wastewater treatment standard of 0.094 mg/liter is not achievable on a routine basis, but that a standard in the range of 0.3 to 0.8 mg/liter represents the treatability of D007 streams. More detailed explanation of these matrix differences is provided later in this paper.

In addition, we provide the EPA a data set that represents treatment of D007 waste on a full scale basis. Details of our process (several hundred pages including drawings) have been provided EPA in comments to the Second Thirds and are not reproduced here.

We request that EPA reevaluate BDAT for chromium in D007 waste, and set the treatment standards on the basis of data provided here, and not based on previous work done on K062 waste which is vastly different from D007. Finally, we do not feel that the treatment standard should be technology transferred from F006, and we are in agreement with EPA's arguments presented in the preamble to the proposed rule.

Comment Number: 8-A-1 (continued)
Docket Number: LD12-00020
Commenter: CyanoKEM
Issue: 8 - Chromium (D007)
Subissue: Treatment Standards
Comment:

CRITIQUE OF BDAT STANDARDS PROPOSED BY EPA

The BDAT standard proposed by EPA is inappropriate for D007 waste. The reasons are primarily the vast differences in the matrices for these wastes, versus the K062 waste that the proposed standard is technology transferred from. (See Docket Document No. LDR7-S0348)

First, K062 wastes are aqueous liquids comprised of 93% water, and are comprised of just a few simple major components, usually either sulfuric or hydrochloric acid, and iron salts. The solids content of these wastes rarely exceeds 0.5%. The waste rarely exceeds levels of 3000 PPM chromium. For example, the non-wastewater K062 streams evaluated by EPA averaged 1500 PPM chromium to begin with, and ranged in concentration from 396 to 7000 PPM. (See Tables 2.7 and 2.8 in Docket Document LDR7-S0348).

In contrast, the D007 waste streams represent a wide variety of physical forms and matrices. Many D007 waste streams are solids and sludges, not liquids like K062, and are comprised of less than 50% water. The solids content often exceeds 30%. In addition, D007 waste tend to be much higher in chromium concentration. For example, treatment data is provided in this paper on a D007 stream containing up to 500,000 PPM chromium. Chromium levels of 20,000 to 80,000 PPM in D007 waste are quite routine, and typically average around 30,000 PPM. The background document written by EPA for development of BDAT for chromium waste D007 (Docket Document No. LD12-S1050) confirms the information we are presenting here, that D007 waste can contain as high as 700,000 PPM chromium, and consist of solids, sludges as well as liquids. In contrast, the untreated K062 waste on which BDAT is based averages only 1500 PPM Cr (See Table 5-2, page 5-5 of EPA's chromium BDAT background document - Docket #LD12-S1050).

Comment Number: 8-A-1 (continued)
Docket Number: LD12-00020
Commenter: CyanoKEM
Issue: 8 - Chromium (D007)
Subissue: Treatment Standards
Comment:

A few examples of D007 waste streams are described below to point out the widely varying matrices. The W number is CyanoKEM's uniquely assigned waste stream identification number.

Waste Stream W2964

This waste is a stripping liquid containing a high level of solids. It is a reddish-orange chromic acid solution, which is quite different from a pickle liquor solution.

Waste Stream W8231

This likewise is a very viscous chromic acid solution very concentrated in hexavalent chromium content. It typically has a specific gravity of 1.19, and as high as 400,000 PPM hexavalent chromium.

It is taken from a chrome plating operation. The waste is received in drums, which often have a thick brown solid phase at the bottom that is included in the treatment batch.

Waste Stream W6436

This waste stream is a washwater from an auto manufacturing paint booth spray operation. It is essentially a wastewater of specific gravity 1.04, and with a lower chromium content of 160 PPM. It is a brownish liquid in appearance with gray suspended solids.

Wastewater Stream W10469

This stream is a chromium sludge sediment from a chrome plating operation. The chromium content varies over a wide range of 16,000 to 72,000 PPM. It is a brown sludge saturated with a green liquid.

Waste Stream W11967

This is chromium plating waste saturated with suspended solids, and having chromium levels of up to 200,000 PPM.

Comment Number: 8-A-1 (cont')
Docket Number: LD12-00020
Commenter: Cyano KEM
Issue: 8-Chromium (D007)
Subissue: treatment standards
Comment:

Waste Stream W11575

This is also a reddish-orange chromic acid solution containing brown sludge residues in the drums. Chromium levels are as high as 72,000 PPM.

Waste Stream W11672

This stream is also a chromium sludge which also has metal grindings present. The waste is from a pelletizing operation.

Waste Stream W11025

This is a chromic acid solution from cleaning out of a chrome plating tank. This waste stream also has a high level of suspended solids and grit, and is a dark brown viscous liquid of specific gravity of 1.3, and chromium levels up to 200,000 PPM.

For these D007 waste streams CyanoKEM feels that the higher concentration of chromium coupled with the more complex physical and chemical matrix makes these more difficult to treat than the K062 waste streams from which EPA tech transferred the BDAT standard. The non-wastewater treatment standard should really be set in the range of 0.3 to 0.8 PPM, not at 0.094 PPM. CyanoKEM presents data here on chromium reduction of ten waste streams followed by precipitation, vacuum filtration and stabilization of the non-wastewater residuals remaining. The process is described in Section III.

CyanoKEM does not feel that the EPA should promulgate the F006 standard as an alternative, and agrees with EPA's comments on the inappropriateness of this technology transfer. We also do not feel that K062 is appropriate, and are presenting data here to provide EPA a data set that is truly based on the restricted waste D007.

Comment Number: 8-A-1 (cont')

Docket Number: LD12-00020

Commenter: CyanoKEM

Issue: 8- Chromium (D007)

Subissue: Treatment Standards

Comment:

TREATMENT DATA

The treatment data for the ten D007 waste stream batches are tabulated below:

Waste Stream Number	Treatment Date	Quantity Waste, Gallons	Untreated Waste Total Chromium, mg/Kg	Non-Wastewater Sludge Treatment Residual Chromium TCLP,mg/liter	Wastewater* Total Chromium, mg/liter
W2964	7/12/89	3000	17,950	0.10	1.09
W8231	7/20/89	880	465,000	0.28	6.92
W10469	8/17/89	1430	16,300	0.07	0.86
W4213	8/18/89	3400	1,000	0.02	2.09
W10941	9/19/89	5000	70,000	0.21	2.44
W6436	9/20/89	6574	160	0.10	0.78
W11025	9/28/89	2000	198,500	0.33	2.54
W11672	10/3/89	5000	6,015	0.13	0.32
W11575	11/16/89	1265	69,500	0.25	0.28
W11967	11/17/89	440	190,100	0.10	0.25

* Wastewater Data is included here for information purposes only. CyanoKEM is requesting EPA revise the non-wastewater BDAT standard based on this data.

The sludge data above is all based on grab samples taken directly from roll-off boxes using a sampling thief. Sludge is sampled from every box prior to disposal to insure compliance with Part 268 Subpart D treatment standards.

Comment Number: 8-A-1 (cont)
Docket Number: LD12-00020
Commenter: CyanoKEM
Issue: 8 - Chromium (D007)
Subissue: treatment standards
Comment:

QUALITY ASSURANCE DATA AND ANALYTICAL METHODOLOGY

TCLP extractions were performed in accordance with the methods detailed in 40CFR268, Appendix I. Chromium analyses are performed at CyanoKEM using the following methodology:

- Test Methods for Evaluating Solid Wastes, SW846, 3rd edition, November 1986.
  - Method 3010 for digestions of TCLP extracts
  - Method 3005 for digestions of waste samples
  - Method 6010 for ICP analyzers

Samples are analyzed for chromium using a Perkin-Elmer Model P40 ICP.

The other analysis conducted at CyanoKEM are described in detail in it's Waste Analysis Plan. This plan, along with other analysis results on the sludge and waste streams presented here are available upon request if needed by EPA in evaluating this data submittal.

Instruments are calibrated daily using a minimum of three point calibration curves. Spike samples are analyzed daily as part of the laboratory quality assurance program. Spike results for the data presented in Section IV are tabulated below in Table V-1.

Comment Number: 8-A-1 (cont)
Docket Number: LD12-00020
Commenter: CyanoKEM
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

TABLE V-I

- Quality Assurance Data
CyanoKEM - Chromium Analysis by ICP

Sample Date	Spike Analyses - % Recovery
7/12/89	138%
7/20/89	105%
8/17-18/89	133%
9/19-20/89	113%
9/28/89	138%
10/3/89	113%
11/16-17/89	135%

Note: Spikes for two sample dates are because the samples were analyzed as part of the same batch.

Comment Number: 8-A-1 (con't)
Docket Number: LD12-00020
Commenter: CyanoKEM
Issue: 8 - Chromium (D007)
Subissue: Treatment Standards
Comment:

CALCULATION OF TREATMENT STANDARD AND CONCLUSIONS

The treatment standard for the D007 data set presented in Section IV are calculated as follows using the Quality Assurance Data in Section V to accuracy adjust the data.

Accuracy Adjustment* Non-Wastewater Treatment Data Chromium, TCLP mg/liter	ln (PPM Cr)
0.095	-2.354
0.267	-1.3205
0.067	-2.703
0.019	-3.963
0.200	-1.609
0.095	-2.354
0.314	-1.158
0.124	-2.088
0.238	-1.436
0.095	-2.354
	$\sigma = 0.8296$

* In accordance with EPA methodology, based on lowest spike recovery to conservatively account for analytical variability and uncertainty - Accuracy Adjustment factor is therefore equal to 100 divided by 105, or 0.952.

The statistics for this data set are as follows:

average = 0.151 mg/liter
variability factor = $\exp(2.33\sigma - 0.5\sigma^2) = 4.898$

Based on this, the treatment standard equals the average times the variability factor, or 0.74 mg/liter as chromium in the TCLP extract.

As discussed, the matrix differences and the ten to one hundred times higher chromium concentration found in D007 waste versus K062 justifies this higher treatment standard for D007. Clearly from this data, the F006 chromium treatment standard of 5.2 PPM does not represent the degree of treatment achievable for D007.

COMMENT NUMBER: 8-A-1
DOCKET NUMBER: LD12-00020
COMMENTER: CyanoKem
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency acknowledges the commenter's remarks stating that the 0.094 mg/l treatment standard for D007 nonwastewaters is not routinely achievable due to the vast differences in the waste matrices versus the K062 waste from which the proposed standards were based. Accordingly, the commenter submitted treatment performance data representing the treatment of wastewaters and presummably solubilized sludges to the Agency from a treatment train consisting of chromium reduction followed by precipitation, vacuum filtration, and stabilization of D007 nonwastewater residues, and requested a standard in the range of 0.3 to 0.8 mg/l. EPA notes that even the HWTC in examining the full set of data in the record, interpreted the data as supporting a standard of 2.12 mg/l.

The commenter submitted 10 data points for treatment of various D007 waste streams. The treated effluents ranged from 0.02 to 0.33 mg/l with an average concentration of 0.151 mg/l for the TCLP. No corresponding untreated TCLP values were given. However, the untreated total chromium concentration ranged from 160 mg/kg to 465,000 mg/kg with an average concentration of 103,453 mg/kg. Because the commenter did not provide the untreated TCLP concentration for these data, the effectiveness of their treatment could not be assessed. As a result, these data were not used to develop the D007 nonwastewater treatment standards.

EPA decided that the proposed nonwastewater treatment standard based on K062 data (which is essentially wastewater data) may not be appropriate for all D007 waste streams although it may be suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out that D007 waste streams differed from the K062

COMMENT NUMBER: 8-A-1 (continued)
DOCKET NUMBER: LD12-00020
COMMENTER: CyanoKem
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

waste from which the proposed standard was based. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters. Based on data submitted during the comment period, the Agency calculated a treatment standard of 4.3 mg/l for D007 nonwastewaters based on data from the Hazardous Waste Treatment Council and Cyanokem Corporation. The bulk of the data submitted during the comment period did not meet EPA's criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations, particularily untreated TCLP for corresponding treated TCLP concentrations; most of the commenters failed to provide untreated TCLP data, 2) no Quality Assurance/Quality Control (QA/QC) data and, 3) lack of design and operations information.

Therefore, the Agency rejected many of these data for consideration of a standard. As a result, the data evaluated to determine the achievable 4.3 mg/l treatment standard represents only a small fraction of the total data received on treatment of D007 wastes. Details on assessment of these data is presented in the Final Best Demonstrated Available Technology Background Document (BDAT) for Chromium wastes D007 and U032.

The Agency first calculated a standard of 0.86 mg/l based on the commenter's data (since all recovery values exceeded 100 percent the accuracy-correction factor was just 1.0). The commenter's data and 10 data points from the Hazardous Waste Treatment Council (HWTC) (with

COMMENT NUMBER: 8-A-1 (continued)
DOCKET NUMBER: LD12-00020
COMMENTER: CyanoKem
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

corresponding TCLP values for the influents and effluents) were combined to yield a treatment standard of 0.74 mg/l. However, the data from the HWTC contained 32 additional incomplete treatment data points (no TCLP analyses), many of which could not meet the 0.74 mg/l standard or the 0.86 mg/l treatment standard. The Agency therefore assumed that the additional data points from HWTC represented valid treatment and decided that the 0.86 mg/l and 0.74 mg/l standard calculated on just 20 data points were not routinely achievable. The Agency found that it was difficult to ascertain (per treatment facility) the mixing ratios of waste volumes that were received from each of the different industries. While the data indicate that some waste contained high concentrations of chromium, the lack of information on mixing ratios and feed rates make it difficult to assess the true effectiveness of treatment (i.e., the Agency could not determine the chromium concentration of the mixed D007 waste prior to treatment).

The Agency points out that the data from Cyanokem represented primarily treatment of liquid wastes (some with very high concentrations of chromium). Some of the sludges generated from this process did not require further treatment (i.e., stabilization). This same situation occurred in generating the promulgated treatment standards of K062 wastes, in that the wastewater treatment process employed for treating the combined K062/D007 wastes was effective enough that the treatment sludges were not characteristic for chromium and did not require any further stabilization. (Thus, the derivation of the 0.094 mg/l proposed standard for D007 wastes.) While Cyanokem's data clearly indicated that the proposed 0.094 mg/l could not be achieved and thus implying that

COMMENT NUMBER: 8-A-1 (continued)
DOCKET NUMBER: LD12-00020
COMMENTER: CyanoKem
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RESPONSE

their combined D007 wastes were more difficult to treat, their data did not represent wastes similar to those represented by the HWTC data which was comprised primarily of sludge stabilization data.

As a result of these comments and data, EPA is withdrawing both of the proposed treatment standards for D007 wastes (i.e., the transfer from F006 and from K062). While the Agency contemplated promulgating the 5.2 mg/l F006 standard, it is even closer to the characteristic level than the 4.3 mg/l calculated using the commenters' data (i.e., Cyanokem's data and 42 data points from HWTC). The treatment standard promulgated today, therefore, is set at 5.0 mg/l chromium (total) (as measured by TCLP). While the majority of commenters supported this approach from a policy standpoint, the Agency is convinced that the available data submitted by them clearly indicate the validity of the achievability of this standard.

Although many of the data submitted during the comment period were not considered for developing a treatment standard, the data did suggest much variability in treatment for D007 nonwastewaters and many commenters expressed concerns that due to the fact that D007 waste matrices are so diverse, (i.e., high total chromium concentrations, higher percentages of hexavalent chromium, and the presence of complexing agents in some D007 waste streams) that the diversity will prevent them from routinely achieving the proposed standard of 0.94 mg/l for D007 nonwastewaters. Some commenters suggested that even the alternate standard of 5.2 from the stabilization of F006 waste may not be achievable for some D007 waste matrices.

COMMENT NUMBER: 8-A-1 (continued)

DOCKET NUMBER: LD12-00020

COMMENTER: CyanoKem

ISSUE: 8-Chromium (D007)

SUBISSUE: Treatment Standards

RESPONSE

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate and wastewaters at 5.0 mg/l total concentration. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-2

Docket Number: LD12-00179

Commenter: DOW

Issue: 8-D007-CHROMIUM

Subissue: TREATMENT STANDARDS

Comment:

XXX. THE CHROMIUM TREATMENT STANDARD LEVEL IS BELOW THE EP TOXIC LEVEL WHICH DESIGNATES A HAZARDOUS WASTE.

54 Fed. Reg. 48,436 column 3

The Agency should consider the impact to the environment when determining the treatment standard levels. The proposed level of 0.094 mg/l chromium in D007 and U032 nonwastewaters is significantly lower than the EP toxic level of 5 mg/l, which is used to identify hazardous wastes. As discussed in detail above, regulation of characteristic wastes below the characteristic levels is not authorized under RCRA.

COMMENT NUMBER: 8-A-2
DOCKET NUMBER: LD12-00179
COMMENTER: DOW
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency is required by Congress to set "levels or methods of treatment, if any, which substantially diminish the toxicity of the waste or substantially reduce the likelihood of migration of hazardous constituents from the waste using the best demonstrated available technology (BDAT), so that short-term and long-term threats to human health and the environment are minimized" (RCRA Section 3004(m)(1), 42 U.S.C. 6924(m)(1). Therefore, the Land Disposal Restrictions Program bases standards on the performance of the Best Demonstrated Available Technology (BDAT) to treat the waste (51 FR 40578).

The Agency received many comments along with treatment data contesting the achievability of 0.094 mg/l standard for D007 nonwastewaters. However, these data show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters. Although these data show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, the Agency is cognizant of the diversity of waste that qualify as hazardous under the D007 classification. Because of this diversity, EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate.

EPA believes that even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group see Section III.A.3(a)(2) of today's Final Third Third Rule) can be treated to this level.

COMMENT NUMBER: 8-A-2 (continued)
DOCKET NUMBER: LD12-00179
COMMENTER: DOW
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

However, for U032 (calcium chromate) EPA is promulgating a treatment standard of 0.094 mg/l for nonwastewaters and 0.032 mg/l for wastewaters. The Agency did not receive any usable treatment performance data for the treatment of U032 wastes. The treatment standards promulgated for U032 are transferred from the treatment of K062 nonwastewaters and wastewaters. The treatment standard for K062 is based on treatment of a mixture of K062 and other EP toxic wastewaters treated by chromium reduction followed by chemical precipitation, settling, filtering, and dewatering of solids. EPA believes that none of the constituents that are likely to be present in U032 will interfere with the reduction treatment of hexavalent chromium achieved in the treated mixture of K062 and EP toxic wastewaters.

Comment Number: 8-A-3
Docket Number: LD12-00073
Commenter: CHEMFIX
Issue: 8 - CHROMIUM - D007
Subissue: TREATMENT STANDARDS
Comment:

CHROMIUM

The agency seems to be caught between suggesting a 0.094 ppm TCLP leach standard for D-007 or 5.2 ppm, neither standard seems to make sense. The standard of 5.2 is above the old "D" standard of 5.0 and it seems to make little sense to loosen up the standard when there is substantial data generated by CHEMFIX (See Database attached) that indicates that this level or one significantly below it can be reached by fixation through the CHEMFIX® Process with and without CHEMSET™ pre-treatment reagents. On the other hand, the suggestion that a 0.094 ppm, non-wastewater standard be set, appears to be unduly stringent. Attached is a composite of "D" metal EP leachate data from a commercial facility in Michigan. The data point for chromium is 0.12 ppm while the total concentration of the chromium was less than 20 ppm. It is possible to get low leachate levels of less than 0.20 from wastes with much higher total chromium level (See Database) but such a low test level of 0.094 ppm would be very difficult to maintain in a commercial facility.

RAW K-048 Incinerator Waste Residue #1- TCLP DATA

Lab Number: C910ML
Page Number: 2

RESULTS

000-009-02 = FBI Raw TCLP

Test	TCLP Extract Concentration	Units	PQL
Arsenic	0.048	mg/l	0.005
Chromium	0.34	mg/l	0.010
Nickel	0.027	mg/l	0.015
Selenium	0.016	mg/l	0.005

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	PQL
Arsenic	BQL	mg/l	0.005
Chromium	BQL	mg/l	0.010
Nickel	BQL	mg/l	0.015
Selenium	BQL	mg/l	0.005
TCLP Extract			
Arsenic	BQL	mg/l	0.005
Chromium	BQL	mg/l	0.010
Nickel	BQL	mg/l	0.015
Selenium	BQL	mg/l	0.005

BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit

Test	Analyst	Date/Time Analyzed
Metals	SZ	10/31/89 19:50

Lab Number: C910MK 8-A-3
Page Number: 2

RESULTS

000-010-02 FBIS-1 Raw TCLP

Test	TCLP Extract Concentration	Units	PQL
Arsenic	0.021	mg/l	0.005
Chromium	0.75	mg/l	0.010
Nickel	0.036	mg/l	0.015
Selenium	0.050	mg/l	0.005

- -

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	PQL
Arsenic	BQL	mg/l	0.005
Chromium	BQL	mg/l	0.010
Nickel	BQL	mg/l	0.015
Selenium	BQL	mg/l	0.005
	TCLP Extract		
Arsenic	BQL	mg/l	0.005
Chromium	BQL	mg/l	0.010
Nickel	BQL	mg/l	0.015
Selenium	BQL	mg/l	0.005

- -

BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit

- -

Test	Analyst	Date/Time Analyzed
Metals	SZ	10/31/89 19:30

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 James Drive West, Suite 100
St. Rose, Louisiana 70087
(504) 469-0333

LABORATORY REPORT

Prepared for: CHEMFIX TECHNOLOGIES

Laboratory Number: R909BE
Date Received: 09/07/89
Job Number:
Sampled By: Client

NARRATIVE

SAMPLE ID	EIRA LAB ID
AMO-2TC #1	R909BE01
AMO-FBI-1	R909BE02

Two (2) samples were received at EIRA for analysis and assigned the above lab numbers. No problems were encountered with the receipt or analysis of the samples. If you have any questions regarding this analysis, please contact the undersigned.

Cynthia E. Albert
Cynthia E. Albert
Project Coordinator

RESULTS

2TC #1

Not applicable

Test	~~TCLP Extract Concentration~~	Units	PQL
Arsenic	~~0.19~~	mg/l	0.025
Chromium	~~0.072~~	mg/l	0.010
Lead	~~BQL~~	mg/l	0.025
Nickel	BQL	mg/l	0.015
Selenium	BQL	mg/l	0.005

FBI-1

Test	TCLP Extract Concentration	Units	PQL
Arsenic	BQL	mg/l	0.005
Chromium	0.42	mg/l	0.020
Lead	BQL	mg/l	0.050

Lab Number: R909BE
Page Number: 2

FBI-1 CONTINUED

Test	TCLP Extract Concentration	Units	PQL
Nickel	BQL	mg/l	0.030
Selenium	BQL	mg/l	0.005

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	PQL
Arsenic	BQL	mg/l	0.005
Chromium	BQL	mg/l	0.010
Lead	BQL	mg/l	0.025
Nickel	BQL	mg/l	0.015
Selenium	BQL	mg/l	0.005

TCLP Extract

Test	Concentration	Units	PQL
Arsenic	BQL	mg/l	0.005
Chromium	BQL	mg/l	0.010
Lead	BQL	mg/l	0.025
Nickel	BQL	mg/l	0.015
Selenium	BQL	mg/l	0.005

BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit

Test	Analyst	Date/Time Analyzed
Metals	SZ	09/11/89 17:30

CO12-00073

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
161 James Drive West, Suite 100
St. Rose, Louisiana 70087
(504) 469-0333

LABORATORY REPORT

Prepared for: **CHEMFIX TECHNOLOGIES**

Laboratory Number: **R909CA**
Date Received: **09/11/89**
Job Number:
Sampled By: **Client**

RESULTS

FBIS-1

Test	Concentration	Units	PQL
Arsenic	BQL	mg/l	0.005
Chromium	1.0	mg/l	0.050
Lead	BQL	mg/l	1.3
Nickel	BQL	mg/l	0.015
Selenium	BQL	mg/l	0.025

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	PQL
Arsenic	BQL	mg/l	0.005
Chromium	BQL	mg/l	0.010
Lead	BQL	mg/l	0.025
Nickel	BQL	mg/l	0.015
Selenium	BQL	mg/l	0.005

TCLP Extract

Test	Concentration	Units	PQL
Arsenic	BQL	mg/l	0.005
Chromium	BQL	mg/l	0.010
Lead	BQL	mg/l	0.025
Nickel	BQL	mg/l	0.015
Selenium	BQL	mg/l	0.005

BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit

Test	Analyst	Date/Time Analyzed
Metals	LH	09/12/89 10:59

METHODS

Test Methods for Evaluating Solid Waste,
Physical/Chemical Methods, SW-846, USEPA 3rd Edition, Revised November, 1986

Arsenic	Method 7060
Chromium	Method 6010
Lead	Method 6010
Nickel	Method 6010
Selenium	Method 7740

Technical Review/Clerical Accuracy/Report Completeness Certified By:

Cynthia E. Albert

Cynthia E. Albert
Project Coordinator

9/20/89
Date

Method Compliance Certified/Data Released By:

John R. Troost
V.P./General Manager Operations

9/20/89
Date

Lab Number: C911UE
Page Number: 2

8-A-3

RESULTS

000-027-004

Test	Concentration	Units	PQL
Arsenic	73900	mg/l	7.5

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	PQL
Arsenic	BQL	mg/l	0.030

BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit

Test	Analyst	Date/Time Analyzed
Metals	LH	11/22/89 10:17

[illegible] Product TCLP DATA/ Treatment Scheme #2 using CHEMSET. Pre-treatment

ab Number: C9110W
age Number: 2

L012-00073

RESULTS

8-A-3

000-027-003

Test	Concentration	Units	PQL
Arsenic	2.7	mg/l	0.50

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	PQL
Arsenic	BQL	mg/l	0.005

BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit

Test	Analyst	Date/Time Analyzed
Metals	SZ	11/03/89 12:00

Lab Number: C910JK
Page Number: 2

LD12-00073

8-A-3

RESULTS

000-027-02

Test	EP Tox Extract Concentration	Units	PQL
Arsenic	0.41	mg/l	0.050

QUALITY CONTROL LAB BLANK

Test	Concentration	Units	PQL
Arsenic	BQL	mg/l	0.005
	EP Tox Extract		
Arsenic	BQL	mg/l	0.005

BQL: Below Quantitation Limit
PQL: Practical Quantitation Limit

Test	Analyst	Date/Time Analyzed
Metals	LH	10/16/89 11:04

ENVIRONMENTAL INDUSTRIAL RESEARCH ASSOCIATES, INC.
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LD12-00073

8-A-3

QC REPORT

BLANK SPIKE RESULT SUMMARY

Test	Batch QC Sample	Spike Level/Unit	% Rec.	Dup. % Rec.	QC Range	RPD	RPD Limit
Arsenic	10ID01	0.05 mg/l	97	98	80-120	1	20

RPD: Relative Percent Difference

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LD12-00073

8-A-3

METHODS

Test Methods for Evaluating Solid Wasth,
Physical/Chemical Methods, SW-846, USEPA 3rd Edition, Revised November, 1986

Arsenic	Method 6010

LD12-00073

8-A-3

CHEMFIX TECHNOLOGIES, INC.
TECHNICAL SERVICES REPORT

CHEMFIX END PRODUCT EP DATA from Commercial Facility Waste

EPA HAZARDOUS WASTE NUMBER	CHARACTERISTIC CONTAMINANT	RAW MATERIAL (mg/kg)	CHEMFIX PRODUCT (mg/l)	REGULATORY LIMIT (mg/l)
D004	Arsenic	<0.002	0.003	5.0
D005	Barium	<0.10	<0.10	100.0
D006	Cadmium	0.501	<0.005	1.0
D007	Chromium	17.9	0.12	5.0
D008	Lead	87.0	<0.10	5.0
D009	Mercury	0.0220	<0.0004	0.2
D010	Selenium	0.006	0.027	1.0
D011	Silver	0.01	0.010	5.0
D012	Endrin	<0.20	<0.002	0.02
D013	Lindane	<0.10	<0.001	0.4
D014	Methoxychlor	<1.0	<0.010	10.0
D015	Toxaphene	<2.0	<0.020	0.5
D016	2,4-D	1.080	<0.120	10.0
D017	2,4,5-TP (Silvex)	<0.085	<0.017	1.0

PHYSICAL CHARACTERISTICS

	pH (S.U.)	Density (g/ml)	Total Solids (%)
Raw Waste	12.2	1.01	3.8

POCKET PENETROMETER READINGS (tons per square foot)

	24 Hours	48 Hours
CHEMFIX PRODUCT	3.25	4.0

:alz

"CALIFORNIA LIST" METALS DATABASE SUMMARY

CONSTITUENTS OF CONCERN	NUMBER OF SAMPLES	TOTAL CONC. (AVERAGE) mg/kg	STATUTORY LEVELS † mg/l	HEALTH BASED STANDARDS mg/l (HBS)	LEACHATE CONCENTRATIONS IN EP EXTRACTS OF CHEMFIX PRODUCT / COMPARED TO HEALTH BASED STANDARD (HBS)		
					LESS THAN 1X HBS*	LESS THAN 10X HBS	LESS THAN 100X HBS**
ARSENIC	229	<0.01 - 2000 (Avg.= 34.47)	500	0.05	101 (44%)	217 (95%)	227 (99%)
CADMIUM	243	0.01 - 98000 (Avg.= 643.9)	100	0.01	13 (5%)	208 (86%)	232 (95%)
CHROMIUM	253	0.03 - 709970 (Avg.= 4035.1)	500	0.05	62 (25%)	231 (91%)	247 (98%)
LEAD	258	0.1 - 96200 (Avg.= 1879.6)	500	0.05	6 (2%)	213 (83%)	253 (98%)
MERCURY	188	0.005 - 37200 (Avg.= 43.70)	20	0.002	34 (18%)	105 (56%)	183 (97%)
NICKEL	234	0.05 - 37320 (Avg.= 588.4)	134	0.34	169 (72%)	229 (98%)	234 (100%)
SELENIUM	201	<0.01 - 80.0 (Avg.= 6.89)	100	0.01	40 (20%)	143 (71%)	199 (99%)
THALLIUM	N.A.	N.A.	130	0.01	N.A.	N.A.	N.A.

N.A. : Sample not anlayzed for constituent.

† : Statutory levels are based on the "California Metal Lists" published on the HSWA 1984.

* : 1 time health based standard equivalent to drinking water standard.

** : 100 times health based standard equivalent to EP toxicity standard.

:wks
12/87

COMMENT NUMBER: 8-A-3
DOCKET NUMBER: LD12-00073
COMMENTER: Chemfix
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency thanks the commenter for submitting treatment performance data for D007 wastes. The Agency reviewed these data along with all of the treatment performance data submitted to the Agency during the comment period. These data lacked untreated waste leachate information and therefore, were not considered in developing the D007 nonwastewater treatment standard. Although these data were deficient in data quality for meeting the BDAT criteria stated above, the Agency calculated a treatment standard of 0.3 mg/l based on the one datum point, i.e., 0.12 mg/l, treated by fixation with "CHEMFIX." However, this datum point's untreated total chromium concentration was only 17.9 mg/kg and the Agency has data from treatment of D007 nonwastewaters as high as 465,000 mg/kg. Also, the details on the assessment of the D007 treatment performance data submitted to the Agency may be found in the Final Best Demonstrated Available Technology Background (BDAT) Document for Chromium Wastes D007 and U032.

After review of all the treatment performance data and comments, the Agency believes that there are likely to be significant differences in the K062 waste and D007 waste, i.e., high total chromium concentrations; higher hexavalent chromium concentrations, and the presence of complexing agents. Because of this diversity many commenters believed that the proposed D007 nonwastewater treatment standard of 0.094 may not be routinely achievable. This position was supported by the vast majority of commenters who strongly objected to the proposed standard.

COMMENT NUMBER: 8-A-3 (continued)
DOCKET NUMBER: LD12-00073
COMMENTER: Chemfix
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters. However, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 wastes with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3(a)(2) of today's Final Third Third Rule) can be treated to this level.

Comment Number: 8-A-34

Docket Number: LD12-00198

Commenter: U.S. DEPT. OF ENERGY (DOE)

Issue: 8-CHROMIUM-D007

Subissue: TREATMENT STANDARDS

Comment:

8) 54 FR 48429, Development of Treatment Standards for EP Toxic Characteristic Metal Wastes.

EPA is proposing treatment standards for the characteristic metals expressed as concentration-based standards or as required methods of treatment. DOE supports the establishment of treatment standards as specified methods of treatment for EP Toxic metal waste subcategories, where such an approach is clearly applicable. However, with respect to concentration-based treatment standards, DOE urges that such treatment standards relative to EP Toxic metal RMW be set at the characteristic level concentrations and that stabilization by solidification be considered an acceptable method of treatment to achieve these levels.

Along with the comments provided herein, DOE is resubmitting a data package to EPA describing a stabilization process to treat certain hazardous and mixed waste streams which contain the metals chromium (D007), lead (D008), cadmium (D006), and silver (D011). This data package, previously submitted on September 26, 1989, describes a solidification method of treatment that results in a stable waste form that will achieve levels below EP Toxic metal concentrations (i.e., performance data indicates that this stabilization process brings the RMW below characteristic levels for the EP Toxic metals identified above).

The data package discussed under this comment is separate from, and should not be confused with, the data package on the low-level RMW fraction generated from the pretreatment of high-level RMW streams. In that pretreatment process the low-level RMW fraction is separated from the high-level RMW fraction and then is sent to a grout solidification facility. This grout solidification data package was previously included as part of the December 22, 1989, submission.

With consideration to the stabilization data package being resubmitted with these comments, DOE requests that EPA evaluate the establishment of separate RMW subcategories specific to each metal (i.e. radioactive chromium subcategory), and establish the hazardous characteristic level as the concentration-based treatment standard, or specified methods of treatment (where applicable), for RMW.

8-A-4

Idaho
National
Engineering
Laboratory

Managed
by the U.S.
Department
of Energy

EG&G

EGG-WM-7225
April 1986

INFORMAL REPORT

HAZARDOUS AND MIXED WASTE SOLIDIFICATION DEVELOPMENT CONDUCTED AT THE IDAHO NATIONAL ENGINEERING LABORATORY

A. M. Boehmer
M. M. Larsen

8-A-4

EGG-WM-7225

HAZARDOUS AND MIXED WASTE SOLIDIFICATION DEVELOPMENT CONDUCTED AT THE IDAHO NATIONAL ENGINEERING LABORATORY

A. M. Boehmer
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Published April 1986

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Idaho Operations Office
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ABSTRACT

EG&G Idaho Inc., has initiated a program to develop safe, efficient, cost-effective solidification treatment methods for the disposal of some of the hazardous and mixed wastes generated at the Idaho National Engineering Laboratory (INEL). Testing has shown that Extraction Procedure (EP) toxic wastes can be successfully solidified using cement, cement-silicate, or ENVIROSTONE binders to produce nontoxic stable waste forms for safe, long-term disposal as general or low-level waste, depending upon the radioactivity. The results of the solidification development program are presented in this report.

HAZARDOUS AND MIXED WASTE SOLIDIFICATION DEVELOPMENT CONDUCTED AT THE IDAHO NATIONAL ENGINEERING LABORATORY

1. INTRODUCTION

In response to the need to develop safe, cost-effective methods for treating hazardous and mixed waste, and based on some knowledge of solidification methods, the Waste Engineering Development group of EG&G Idaho initiated a program to investigate the following:

- Hazardous and mixed wastes at the INEL that are candidates for solidification
- Treatment options available for each waste
- Available commercial solidification methods and their applicability to INEL wastes
- Lab-scale testing of solidification methods for developing waste formulas (binder-to-waste ratios)
- Testing solidified samples to verify that they pass EP toxicity criteria.

The intent of this program is to provide a treatment method that will result in a nonhazardous, stable waste form that will satisfy EPA regulations and can be disposed of as a general or low-level waste.

An inventory of hazardous and mixed wastes generated at the INEL identified:

- Amounts of waste stored and awaiting disposal
- Annual generation rates
- Storage location/generating facility

2. WASTE IDENTIFICATION AND CHARACTERIZATION

The initial phase of the solidification program was the determination of waste volumes and characterization of the identified wastes.

An inventory of hazardous and mixed wastes generated at the INEL was prepared and used as a basis for waste characterization. The inventory included the amounts of waste stored and awaiting disposal, annual generation rates, basis for the hazardous listing, and storage location and/or generating facility.

An investigation of the characteristics of each waste was initiated. This entailed performing a waste analysis or documenting analyses already completed for each waste, defining the waste stream, verifying the data in the inventory listing, refining volume estimates, eliminating one-time wastes that have already been dispositioned, and adding other waste streams and their characteristics as they were identified. To determine waste characteristics, a radiological analysis was completed and an evaluation of the waste also was performed, using EPA procedures to determine its hazardous constituents. The results of this investigation are contained in Table 1 and documented in Reference 1.

The chemical characteristics of concern in the wastes include ignitability, corrosivity, reactivity, and EP toxicity. It is these characteristics that cause the waste to be considered hazardous by EPA definitions. A waste is considered ignitable if it exhibits any of the following properties:

- A closed-cup flash point of less than 60°C
- At standard temperature and pressure, a capability of causing fire through friction, absorption of moisture, or spontaneous chemical changes; and when ignited, burns so vigorously and persistently that it creates a hazard

TABLE 1. (continued)

Description of Waste	Chemical and Radiological Composition	Quantity Generated Annually	Basis for Hazard Listing	Waste Location and Contact	Is Further Analysis Required	Treatment Options
HW-15. Potassium chromate as corrosion inhibitor in process water	Potassium chromate	1240 gal	EP Toxic	NRF	--[g]	Treatment with ion-exchange resins
HW-16. Phosphoric acid from chemical lab	Phosphoric acid	1240 gal	Corrosive	NRF	--[a]	Neutralization
HW-17. Sulfuric acid spill residues	Sulfuric acid	1240 gal	Corrosive	NRF	--[a]	Neutralization
HW-18. Sodium hydroxide from lab operations	Sodium hydroxide	1240 gal	Corrosive	NRF	--[a]	Neutralization
HW-19. Ammonium hydroxide from lab operations	Ammonium hydroxide	55 gal	Corrosive	NRF	--[a]	Neutralization
HW-20. Mixed formaldehyde and mercuric nitrate from chemical analysis	Formaldehyde, mercuric nitrate	110 gal[b]	EP Toxic Ignitable	NRF	--[f]	Solidification Incineration
HW-21. Formaldehyde from chemical analysis	Formaldehyde	495 gal	Ignitable	NRF	--[a]	Incineration
HW-22. Paint thinners from paint shop	Stoddard solvent; Amercoat-12 (acetone, xylol); lacquer thinner (toluol, ketones, alcohol); petroleum, distillates and paint thinner--MM-1255	550 gal	Ignitable	NRF	--[a] --[a]	Recycling Incineration
HW-23. Laboratory packs	Varies	605 gal	Varies	NRF	--[d]	Undecided
HW-24. Sulfuric acid	Sulfuric acid	55 gal	Corrosive	NRF	--[a]	Neutralization
HW-25. Potassium hydroxide	Potassium hydroxide	55 gal	Corrosive	NRF	--[a]	Neutralization
HW-26. Solvent cleaning	Trichloroethylene	200 gal	Toxic	NRF	--[a] --[a]	Recycling Incineration
HW-27. Degreasing of reactor components	Acetone	5 gal/4 y	Ignitable	NRF	--[a]	Incineration
HW-28. Paint stripping	Methylene chloride	Irregular	Toxic	NRF	--[a]	Incineration

TABLE 1. (continued)

Description of Waste	Chemical and Radiological Composition	Quantity Generated Annually	Basis for Hazard Listing	Waste Location and Contact	Is Further Analysis Required	Treatment Options
Radioactive Mixed Waste						
RMW-1. PCB oil (V-2 oil)	600 ppm PCB, contaminated oils 90 mrem/h beta-gamma near contact, uranium 0.65 mg/L, TRU 0.12 nCi/g	100 gal^b	TSCA regulated	TAN Dick Meservey	No	Incineration
RMW-2. Flyash	Cd, Cr, Pb, low-level radioactivity	5 drums^b 15 drums	EP Toxic Toxic	WERF Dan Bartel	No^g	Solidification
RMW-3. Mercury-contaminated pipe	Mercury low-level radioactivity	420 lb^b	EP Toxic	TAN HTRE Wyndell Banister	No	Undecided
RMW-4. Mercury	Mercury, Cs-137 2 mrem/h	1 L^b	EP Toxic	TAN/Hot Cells Garry Fife	No	Solidification Recycling
RMW-5. Paint and rags	Lead-based paint, solvent on rags low-level radioactivity	1 drum^b	Ignitable EP Toxic	ANL-W Mike Holzemer	No	Incineration
RMW-6. Paint stripper and rags	Methylene chloride, paint, rags low-level radioactivity	2 drums	Toxic	ANL-W Mike Holzemer	No	Incineration
RMW-7. Combustible wastes	Paper, sample bottles, gloves, etc., low uranium and cadmium	15 drums	EP Toxic	CPP Bob Hebeker	--^a	Incineration
RMW-8. PCB dirt	15 ppm PCB, Cs-137 107 counts/min	10 drums	TSCA regulated	CPP Susan Cooper	--^c	Waste has been dispositioned
RMW-9. Silver zeolite	Silver, zeolite, variable radioactivity	3600 lb 1200 lb 1500 lb	EP Toxic	TAN/TSF-Armel Cates TRA-Derrill Sparks PBF-Fred Stoll	No	Recycling
RMW-10. Miscellaneous lab wastes	Water, organics (30%), heavy metals, variable radioactivity	10 gal	EP Toxic	TRA Janine Jessup	--^a	Incineration Solidification
RMW-11. Organic radiological leaching solutions from labs	CCl_4, Hexane, Cr, Pb, low-level radioactivity	3 gal^b	Ignitable EP Toxic	TRA Janine Jessup	--^a	Incineration
RMW-12. Potassium chromate	Potassium chromate, low-level radioactivity	500 mL	EP Toxic	NRF Lucy Schweiss	No^g	Solidification
RMW-13. Silver nitrate	Silver nitrate	1 L	EP Toxic	NRF Lucy Schweiss	No	Solidification

TABLE 1. (continued)

Description of Waste	Chemical and Radiological Composition	Quantity Generated Annually	Basis for Hazard Listing	Waste Location and Contact	Is Further Analysis Required	Treatment Options
RWM-26. Lead dross and dust from anticipated refining operations	Lead dross and dust, low-level radioactivity	5500 lb (5-10% of recycled lead as slag)	EP Toxic	Undetermined	g	Solidification
RWM-27. Sizing baghouse dust	Cadmium, low-level radioactivity	2 drums[b] 2 drums	EP Toxic	WERF Dan Bartel	No	Solidification
RWM-28. HEPA prefilters	Cadmium, Lead, low-level radioactivity	16 filters every 4 y	EP Toxic	WERF Dan Bartel	--[a]	Undetermined
RWM-29. Sizing baghouse filters	Cadmium, low-level radioactivity	12 filters every 4 y	EP Toxic	WERF Dan Bartel	--[a]	Undetermined

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a. Waste will require analysis prior to implementation of treatment option.

b. Quantity generated and awaiting disposal.

c. Waste has been shipped offsite for disposal.

d. Analysis requirements and treatment options will be evaluated once the waste is generated.

e. Waste stream requires further analysis before sampling decision is made.

f. Waste has been sampled and is undergoing analysis.

g. Development work is being conducted.

h. This is a classified waste and will be dispositioned by CPP.

i. Up to 200 gal may be generated on an emergency, infrequent basis.

j. Waste is presently being analyzed to determine if it is a mixed or low-level waste.

k. Analysis has been completed on presently stored ash; this ash has not shown any hazardous constituents. Sampling and analysis of the ash will be required if the incinerator burns any hazardous waste.

TABLE 2. EP TOXICITY PROCEDURE METALS AND THEIR CONCENTRATION LIMITS

Metal	Limit (mg/L)
Arsenic	5.0
Barium	100.0
Cadmium	1.0
Chromium	5.0
Lead	5.0
Mercury	0.2
Selenium	1.0
Silver	5.0

TABLE 3. (continued)

	Compound
36	Toluene
37[a]	Toxaphene
38	1,1,1-Trichloroethane
39	1,1,2-Trichloroethane
40	Trichloroethylene
41	2,4,5-Trichlorophenol
42	2,4,6-Trichlorophenol
43[a]	2,4,5-Trichlorophenoxypropionic acid
44	Vinyl chloride

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a. Currently part of the EP toxicity list of hazardous compounds.

3. TREATMENT OPTIONS EVALUATION

The second phase of the program was to perform a treatment options evaluation for each waste listed in Table 1. This involved evaluating the waste characteristics and determining treatment options. The treatment options considered were: incineration, solidification, neutralization, recycling, refining, or storing the waste until a processing technology can be developed. Commercial disposal offsite was also considered an option for the hazardous wastes.

Other factors that influenced the treatment options evaluation included: waste form, future DOE liability for the waste, onsite incinerator availability, and safety considerations. No hazardous or radioactive-mixed waste will be disposed of at the INEL.

In general, the decision analysis determined that ignitable organic and other combustible wastes will be incinerated, acid and caustic wastes will be neutralized, and EP toxic wastes solidified. The list of waste streams considered to be candidates for solidification is presented in Table 4. Wastes that are hazardous because of their corrosivity are also included as candidate wastes because detailed analysis (to be conducted when samples are available) may show EP toxic constituents in excess of the limits. Such wastes will then require solidification processing after neutralization. Waste streams whose treatment option is presently undecided are also included.

TABLE 4. (continued)

Description of Waste	Chemical and Radiological Composition	Quantity Generated Annually	Basis for Hazard Listing	Waste Location and Contact	Is Further Analysis Required	Treatment Options
HW-31. Lead shop waste	Lead dross and dust	500 lb	EP Toxic	CFA Ruel Dye	--[g] No	Solidification Recycling
HW-39. Phosphoric acid from electropolisher	Phosphoric acid	6-1/2 drums	Corrosive	HWSF	No	Neutralization
Radioactive Mixed Waste						
RMW-2. Flyash	Cd, Cr, Pb, low-level radioactivity	5 drums[b] 15 drums	EP Toxic Toxic	WERF Dan Bartel	No[g]	Solidification
RMW-3. Mercury-contaminated pipe	Mercury low-level radioactivity	420 lb[b]	EP Toxic	TAN-HTHE Wyndell Banister	No	Undecided
RMW-4. Mercury	Mercury, Cs-137 2 mrem/h	1 L[b]	EP Toxic	TAN/Hot Cells Garry Fife	No	Solidification Recycling
RMW-10. Miscellaneous lab wastes	Water, organics (30%), heavy metals, variable radioactivity	10 gal	EP Toxic	TRA Janine Jessup	--[a]	Incineration Solidification
RMW-12. Potassium chromate	Potassium chromate, low-level radioactivity	500 mL	EP Toxic	NRF Lucy Schweiss	No[g]	Solidification
RMW-13. Silver nitrate	Silver nitrate	1 L	EP Toxic	NRF Lucy Schweiss	No	Solidification
RMW-14. Freon decontamination still bottoms and disposable filters	Freon, metals, intermediate radioactivity	2 drums	Toxic EP Toxic	TRA-Tolan Whitlock WERF-Dan Bartel	--[a]	Solidification
RMW-15. Lab wastes	Water, acids, heavy metals, variable radioactivity	120 gal	Corrosive EP Toxic	TRA Janine Jessup	--[a]	Neutralization Solidification
RMW-19. IET waste	Mercury, radioactivity	100 gal sludge plus pipe[b]	EP Toxic	IET Wyndell Banister	--[j]	Solidification
RMW-22. Incinerator ash	Lead, low-level radioactivity	15 drums	EP Toxic	WERF Dan Bartel	No[k]	Solidification
RMW-24. Activated Charcoal from CPP	Mercury, low-level radioactivity	150 ft^3	EP Toxic	CPP	[g]	Solidification

4. SOLIDIFICATION SYSTEMS EVALUATION

The third phase of solidification development consisted of investigating available commercial solidification methods, which included literature review, contacting various companies involved in waste solidification, visiting operating waste solidification facilities, and performing comparative evaluations of the various systems and their applicability to INEL hazardous and mixed wastes. Evaluations have included: investigation of solidification systems by Stock, Chem Nuclear, General Electric, Associated Technologies Incorporated, Koch Process Systems Incorporated, ATCOR Engineered Systems Incorporated; and solidification processing using the following waste binders: Delaware Custom Material (DCM) cement-silicate, Fujibeton products, PQ Corporation silicates, FASTCRETE, and United States Gypsum Company's (USGC) ENVIROSTONE.

In evaluation of the above-listed solidification systems/binders, with regard to their applicability to INEL wastes, it was determined that the most functional systems for INEL waste were the DCM cement-silicate process and solidification using ENVIROSTONE. DCM cement-silicate and ENVIROSTONE can be used very efficiently for processing relatively small volumes of waste, and also provide acceptable waste monoliths for a wide variety of waste streams. These processes were also chosen because of their short implementation time, ease of operability, and cost effectiveness. The other systems evaluated were designed for higher throughput rates and waste streams with higher radioactivity than will be solidified at the INEL.

- o Use of various available waste binders.

Figure 1 shows representative lab-scale solidified samples of potassium chromate solidified with ENVIROSTONE (Samples 17, 8, and 3) and cement-silicate (Samples 7, 4, and 2). Table 5 shows the binder-to-waste ratios used for each waste tested.

In considering set time, comparisons were made of stirring times required, time required for the monolith to solidify, and with the cement-silicate, if solidification was instantaneous. The ENVIROSTONE samples required a longer stirring time (4 to 5 min), than the cement-silicate (soft set within 10 s of silicate addition). The ENVIROSTONE samples set into a single, hard block without void space, whereas the cement-silicate samples had void space in them due to their instantaneous soft set. The set time of the ENVIROSTONE samples to a hard set was faster than that of the cement-silicate samples.

Monolith characteristics considered were: compressive strength--did the monolith set up into one solid sample or did it crumble, crack, or stay moist and flexible (no actual compressive strengths were measured); was there free liquid remaining on top of the sample; and variations of pH. The ENVIROSTONE samples set into a single solid sample, but the cement-silicate samples seemed to remain crumbly or moist and flexible. Some of the samples had free liquid standing on top, but it was absorbed within 48 h. The pH of the potassium-chromate solution and the lead dross solidified with ENVIROSTONE ranged from 6 to 9, and those done with cement-silicate ranged from 11.8 to 12.6,

Following development of binder-to-waste ratios, the solidified samples were sent to laboratories for leach testing. Leach testing was performed using EPA's TCLP in most cases; however, some testing was also conducted using the EPA's EP toxicity preparations and these are specified. The results of the leach testing are discussed in the following section.

TABLE 5. SAMPLE FORMULATIONS

Sample Number	Waste Specie[a]	Water (mL)	Cement (g)	Silicate (mL)	ENVIROSTONE (g)
2	A - 100 mL	--	96	32	--
3	A - 100 mL	--	--	--	100
4	A - 100 mL	--	72	24	--
7	A - 100 mL	--	48	16	--
8	A - 100 mL	--	--	--	87.5
17	A - 100 mL	--	--	--	75
1/2 C1	B - 75 mL	--	54	18	--
1/2 E1	B - 75 mL	--	--	--	56.25
1/2 C2	B - 50 mL	--	72	24	--
1/2 C3	B - 50 mL	--	96	32	--
1/2 E2	B - 50 mL	--	--	--	100
1/2 E3	B - 50 mL	25	--	--	125
1/5 C1	C - 50 mL	--	36	12	--
1/5 E1	C - 50 mL	--	--	--	50
1/5 C2	C - 50 mL	--	72	24	--
1/5 C3	C - 50 mL	--	96	32	--
1/5 E2	C - 50 mL	--	--	--	100
1/10 C1	D - 50 mL	--	36	12	--
1/10 E1	D - 50 mL	--	--	--	50
1/10 C2	D - 50 mL	--	72	24	--
1/10 C3	D - 50 mL	--	96	32	--
1/10 E2	D - 50 mL	--	--	--	100
SC	E - 50 g	50	51	17	--
SC 1	E - 50 g	100	120	40	--
SC 2	E - 50 g	100	150	50	--
SC 3	E - 50 g	50	72	--	--
SE	E - 50 g	50	--	--	75
SE 1	E - 50 g	100	--	--	200
SE 2	E - 50 g	125	--	--	250
SE 3	E - 50 g	100	--	--	129
D1 A	F - 50 g	140	--	--	--
D1 B	F - 50 g	100	36	--	--
D1 C	F - 50 g	100	36	12	--
D1 D	F - 50 g	100	--	--	50
D1.E	F - 50 g	100[b]	--	--	--
D1 F	F - 50 g	100[b]	72	--	--
D1 G	F - 50 g	100[b]	36	12	--

6. RESULTS

6.1 Potassium Chromate Test Results

The sample used in development work was a 2500 ppm potassium-chromate solution made in the laboratory to simulate the actual waste stream. The waste stream is 18,000 gal of a 2500 ppm potassium-chromate solution that was used as shield tank water around a reactor. The potassium chromate is added to the water as a corrosion inhibitor.

Testing also was conducted with solutions of increased potassium-chromate concentration. Potassium-chromate solution was evaporated in ratios of 2 to 1, 5 to 1, and 10 to 1 to provide solutions of 5000 ppm, 12,500 ppm, and 25,000 ppm, respectively. The evaporation procedure was conducted to determine if potassium-chromate solutions of higher concentrations could be successfully solidified. Successful solidification of the concentrated solutions would allow evaporation to be used to minimize the volume of waste requiring disposal and to reduce disposal costs.

Leach testing results (see Table 6) have shown that the 2500 ppm potassium-chromate solution requires, as a minimum amount for successful solidification, 72 g of cement and 24 mL of silicate, or 87.5 g of ENVIROSTONE per 100 mL of solution. The 5000 ppm potassium-chromate solution required 72 g of cement and 24 mL of silicate, or 100 g of ENVIROSTONE per 50 mL of solution for successful solidification. The 12,500 ppm potassium-chromate solution required 96 g of cement and 32 mL of silicate. A successful solidification of the 12,500 ppm potassium-chromate solution using ENVIROSTONE was not obtained. The 25,000 ppm potassium-chromate solution was not successfully solidified using either the cement-silicate or the ENVIROSTONE.

This testing has shown that potassium-chromate solution of concentrations up to 12,500 ppm can be successfully solidified using the cement-silicate binder, providing a safe, efficient, and cost-effective method of treatment for this waste stream.

Another potential method for treating the potassium-chromate solution is removal of the chromium through ion-exchange resins. Leach testing conducted on chromium-loaded resins showed leachable chromium concentrations to be below the EPA limits.

6.2 Lead Dross Test Results

The lead dross used in development work was obtained from a refining firm, and is an actual sample of the dross generated in the refining process. Development is being conducted on this waste because the INEL has waste lead that must be dispositioned, and refining may be the most viable option.

Testing of the lead dross (see Table 7 for results) has not, using the most conservative results, shown a successful solidification. However, the leach test results of the solidified samples, when compared to the unsolidified samples leach test results, show a significant decrease in the leach rate. Further testing of binder-to-waste ratios should be successful. Four of the samples analyzed showed lead concentrations below the 5.0-mg/L limit established by the EPA. However, duplicate samples analyzed at another laboratory showed lead concentrations greater than the limit. Further testing is required to determine the differences in results from the various laboratories.

6.3 Fly Ash Test Results

The fly ash used was obtained from the Waste Experimental Reduction Facility. The fly ash is off-gas dust collected in the baghouse during incineration operations at the facility. The constituents of concern in the fly ash, from a toxicity standpoint, are cadmium and lead. Testing the fly ash also included solidifying samples that used the 2500 ppm potassium-chromate solution instead of demineralized water. This testing was performed to investigate the possibility of combining these waste streams for treatment, thereby reducing the total waste volume, labor, and burial costs associated with the disposal of these wastes.

Testing the fly ash has shown that successful solidification requires 36 g of cement per 50 g of fly ash with 100 mL water as a minimum (see Table 8 for results). Addition of the silicate with the cement had the tendency to reduce the amount of lead that leached from the sample. Silicate alone, however, had no effect on the leach rates of any of the three contaminants. A successful solidification of the fly ash using the ENVIROSTONE binder was not obtained.

In testing the fly ash using potassium-chromate solution instead of water, successful solidification was obtained when 36 g of cement and 12 mL of silicate per 50 g of fly ash with 100 mL of 2500 ppm potassium-chromate solution were used as a minimum. Again, in these samples, the silicate tended to reduce the amount of lead that leached from the sample, but in these samples the silicate was required with the cement for successful solidification. A successful solidification of the fly ash and potassium chromate using the ENVIROSTONE binder was not obtained.

The results of the fly ash testing have shown that the fly ash can be successfully solidified using water and cement, or the potassium-chromate solution with the cement-silicate binders. This will provide a safe, efficient, cost-effective treatment method for long-term disposal of both the fly ash and potassium chromate waste streams.

6.4 Photochemical Waste Test Results

The photochemical waste used in development work was obtained from a drum of this waste located at the Hazardous Waste Storage Facility. This waste stream is generated at the Naval Reactor Facility during chemical analysis procedures. The constituent of concern in this waste, from a toxicity standpoint, is silver.

TABLE 9. TEST RESULTS OF SOLIDIFIED PHOTOCHEMICAL WASTE SAMPLES

	Silver Concentration Detected[a] (mg/L)	
Sample Number[b]	Lab Number 1	Lab Number 2
PW	3.4[c]	93.8[c]
PW1	.09	--
PW2	.03	.08
PW3	.01	.38
PW6	.30	5.89
PW7	.29	3.94

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a. The toxic limit for silver concentration is 5.0 mg/L.

b. See Table 5 for sample formulation.

c. Analysis of unsolidified sample.

TABLE 10. RESULTS OF SOLIDIFIED ACTIVATED CHARCOAL SAMPLES

Sample Number[b]	Mercury Concentration Detected[a] (mg/L)
CPP-EP[c,d]	0.03
CPP-NT[c]	0.14
CPP1	0.0024
CPP2	0.0026
CPP3	0.0020
CPP4	0.0039
CPP5	0.085
CPP6	0.058

---

a. The toxic limit for mercury concentration is 0.2 mg/L.

b. See Table 5 for sample formulations.

c. Unsolidified sample.

d. Tested by EP toxicity test.

TABLE 11. ANALYSIS RESULTS OF STANDARD SOLUTION SAMPLES

		Concentration Detected (mg/L)	
Standard	Sample Number	Lab Number 1	Lab Number 2
1000 ppm Arsenic	SS1	933	958
1000 ppm Chromium	SS2	1013	827
1000 ppm Lead	SS3	950	1011
1000 ppm Mercury	SS4	1018	1349
1000 ppm Selenium	SS5	968	426
1000 ppm Silver	SS6	1071	1242

TABLE 12. ANALYSIS RESULTS OF SPLIT/SECTION SAMPLES

Sample Number[a]	Lab Number	Test Method	Sample Size[b]	Concentration Detected (mg/L) Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
C1	2	EP TOX	Chunk	<0.3	1.7	<0.05	0.44	0.39	<0.02	<0.4	<0.01
C2	2	TCLP	Chunk	<0.3	1.7	<0.05	0.36	0.54	<0.02	<0.4	<0.03
C3	2	TCLP	1/8 in.	<0.3	1.7	<0.05	0.73	0.34	<0.02	<0.4	0.01
C4	2	TCLP	1/4 in.	<0.3	1.7	<0.05	1.7	0.41	<0.02	<0.4	0.04
C5	2	TCLP	3/8 in.	<0.3	1.4	<0.05	0.12	0.30	<0.02	<0.4	<0.03
C6	1	EP TOX	Chunk	<0.01	0.8	<0.001	0.08	<0.01	0.0019	<0.01	<0.01
C7	1	TCLP	Chunk	<0.01	1.4	<0.001	0.10	0.02	0.0008	0.01	<0.01
C8	1	TCLP	1/8 in.	<0.01	1.4	<0.001	0.10	<0.01	0.0006	0.01	<0.01
C9	1	TCLP	1/4 in.	<0.01	0.9	<0.001	0.20	<0.01	0.0005	0.01	<0.01
C10	1	TCLP	3/8 in.	<0.01	0.7	<0.001	0.20	<0.01	0.0004	0.02	<0.01
CS1	1	EP TOX	Chunk	<0.01	0.9	<0.001	1.6	<0.01	0.0012	<0.01	<0.01
CS2	1	TCLP	Chunk	<0.01	1.0	<0.001	2.0	<0.01	0.0004	0.01	<0.01
CS3	1	TCLP	1/8 in.	<0.01	1.3	<0.001	2.0	<0.01	<0.0004	0.01	<0.01
CS4	1	TCLP	1/4 in.	<0.01	1.3	<0.001	2.1	<0.01	<0.0004	0.01	<0.01
CS5	1	TCLP	3/8 in.	<0.01	0.8	<0.001	2.8	<0.01	<0.0004	0.02	<0.01
CS6	2	EP TOX	Chunk	<0.3	1.8	<0.05	0.47	0.69	<0.02	<0.4	<0.03
CS7	2	TCLP	Chunk	<0.3	1.7	<0.05	0.97	0.66	<0.02	<0.4	0.03
CS8	2	TCLP	1/8 in.	<0.3	1.6	<0.05	1.35	0.83	<0.02	<0.4	<0.03
CS9	2	TCLP	1/4 in.	<0.3	1.1	<0.05	0.57	<0.1	<0.02	<0.4	<0.03
CS10	2	TCLP	3/8 in.	<0.3	1.5	<0.05	1.1	<0.1	<0.02	<0.4	<0.03
E1	1	EP TOX	Chunk	<0.01	<0.1	<0.001	3.7	<0.01	0.0009	<0.01	<0.01
E2	1	TCLP	Chunk	<0.01	<0.1	<0.001	4.4	<0.01	0.0004	0.01	<0.01
E4	1	TCLP	1/4 in.	<0.01	<0.1	<0.001	4.5	<0.01	0.0005	0.01	<0.01
E5	1	TCLP	3/8 in.	<0.01	<0.1	<0.001	4.7	<0.01	0.0004	0.01	<0.01

8. PLANNED ACTIVITIES

In addition to the development work contained in this report, testing and analysis will be conducted on the following wastes: mercury; mercury-contaminated sludge; and other wastes determined to be candidates for solidification as they become available. The work conducted on these wastes will be performed in the same manner as that presented in this report.

After an optimum binder-to-waste ratio has been developed and tested, and verification that it meets disposal criteria conducted, the ratio will be used for solidification of a drum of waste. A drum of waste will be solidified to verify that the binder-to-waste ratio developed in the small samples will provide successful solidification of the waste in production scale. The drum monolith will be sectioned and each section subjected to toxicity testing to verify homogeneity.

The drum solidifications will be conducted using simple mixing systems such as the DCM sacrificial blade system or a drum rotator. These are shown in Figures 2 and 3.

The EPA requires facilities treating hazardous waste to have a RCRA Part B permit. EG&G Idaho has submitted an application for this permit. Development activities will be conducted to support this application; however, production-scale solidification of hazardous waste will not be conducted until the permit has been granted.

After drum-scale tests have verified acceptable monoliths for disposal, solidification of wastes awaiting disposal will begin. The first waste scheduled for solidification are the WERF-incinerator bottom ash and fly ash.

Solidification of waste at the INEL will be an ongoing activity and each waste, as it is identified, will be subjected to waste

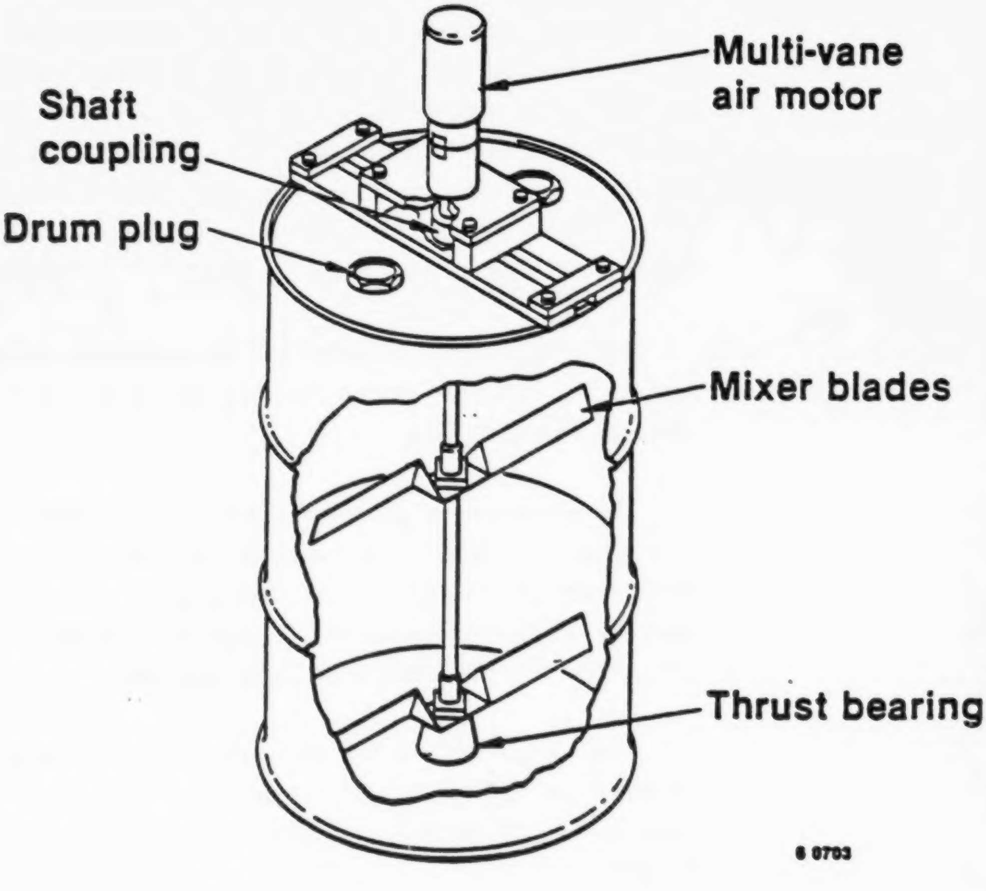
Multi-vane
air motor
Shaft
coupling
Drum plug
Mixer blades
Thrust bearing
8 0703

Figure 2. DCM drum system.

9. CONCLUSIONS

The purpose of the solidification development program is to provide a safe and effective method of treatment for the hazardous and mixed wastes generated at the INEL. The steps taken in the program thus far are:

- Waste characterization
- Treatment options evaluation lab-scale testing for development of waste formulas
- Testing of solidified samples to verify that they meet EPA toxicity criteria.

The development work conducted and reported in this report shows that solidification does provide a safe and effective method for treating EP toxic hazardous and mixed waste so that the resulting form is nontoxic, will satisfy EPA regulations, and can be disposed of as a nonhazardous or low-level waste.

COMMENT NUMBER: 8-A-4
DOCKET NUMBER: LD12-00198
COMMENTER: U.S. Dept. of Energy (DOE)
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency ackowledges the commenters remarks and thanks the commenter for submitting the Solidification Development Report for treatment of D007 waste and mixed radioactive waste. The Agency reviewed this data along with all of the treatment performance data submitted to the Agency. These data consisted of solidification of a synthetic waste stream i e., potassium chromate; and fly ash data from incineration processes at the facility. These data were not used in determining a D007 nonwastewater treatment standard as they were laboratory data intended to show the effectiveness of solidification of EP toxic metals, and did not include enough information for calculating a standard i.e., untreated TCLP concentrations and Quality Assurance/Quality Control (QA/QC) Data.

The data show highly variable results (ranging from 1.03 to 235 mg/l for the treated potassium chromate waste stream, and 0.02 to 5.28 mg/l for the solidified fly ash waste stream. These data show that the higher the concentrations of chromium in the waste streams that the commenter treated, the more difficult it was to stabilize their waste. For example, 27 of the 44 data points from the potassium chromate waste stream points exceeded the 5.0 characteristic level. Although these data are not sufficient in BDAT data quality and are highly variable, if they were used to develop standards, these data would have resulted in standards of 18 mg/l for the potassium chromate data set and 270 mg/l for the treated fly ash data set. Details on the assessment of all of the D007 treatment performance data submitted to the Agency may be found in the Final BDAT Background Document (BDAT) for Chromium Waste D007 and U032.

COMMENT NUMBER: 8-A-4 (continued)
DOCKET NUMBER: LD12-00198
COMMENTER: U.S. Dept. of Energy (DOE)
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The commenter favored a method of treatment over concentration-based standards. However, the Agency believes that concentration-based treatment standards wherever possible provide the treater with the maximum flexibility for treating waste. After review of all the treatment performance data and comments, the Agency believes that due to the differences in the K062 waste and D007 wastes, the proposed nonwastewater treatment standard may not be routinely achievable. This position was held by the vast majority of commenters who strongly objected to the proposed standard.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity, EPA has chosen to regulate D007 nonwastewaters at the charactertistic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-5
Docket Number: LD12-00080
Commenter: Phillips Petroleum Company
Issue: 8-Chromium (D007)
Subissue: Treatment Standards.
Comment:

The Agency has proposed a technology transfer for treatment of D007 nonwastewaters from K062, a waste classified as a wastewater by the agency in the August 17, 1987, Federal Register. However, several D007 wastes, such as chromium laden catalyst, are solids. Since the technology transfer of reduction followed by precipitation is based on a waste with vastly different physical and chemical properties, there are no treatment data to verify that the proposed treatment levels can be achieved. Accordingly, a treatment standard for D007 wastes based on solidification of 5.2 mg/l for a TCLP extract is more appropriate.

COMMENT NUMBER: 8-A-5
DOCKET NUMBER: LD12-00080
COMMENTER: Phillips Petroleum Company
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency acknowledges the commenter's remakrs asserting that the proposed D007 nonwastewater standard of 0.094 mg/l is unachievable and should be based on the stabilization data F006 wastes rather than K062 data. EPA has reviewed all of the D007 performance data submitted to the Agency during the comment period and has determined that the proposed standard 0.094 mg/l may not be routinely achievable for all D007 matrices. Based on the data submitted during the comment period, the Agency has determined that a treatment standard of 4.3 mg/l may be more consistently achievable for most treaters of D007 nonwastewaters. Details on the Agency's assessment of these data and calcuation of a resultant treatment standard from these data are discussed in the Final BDAT Background Document for Chromium Wastes D007 and U032.

Although the data available to the Agency show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the wide diversity of waste that qualify as D007 wastes. Because of this diversity, EPA has chosen to regulate D007 nonwastewater and wastewaters at the characteristic level of 5.0 ppm. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3 (a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-6
Docket Number: LD12-00088
Commenter: INCO UNITED STATES, INC
Issue: 8-Chromium
Subissue: Treatment Standards
Comment:

Sixth, the treatment standard for nonwastewater forms of D007 (i.e., wastes that exhibit the characteristic of EP Toxicity for chromium) should be based on the transfer of TCLP performance data for stabilization of F006 wastes, rather than on the transfer of data for K062. The TCLP data for K062 that EPA has developed reflect the treatment of highly alkaline wastes containing levels of chromium that are well below the levels found in many D007 nonwastewaters. The performance reflected in the K062 data does not appear to be achievable for wastes (including many D007 filter cakes) in which the chromium levels are much higher, particularly when the wastes are not generated as a result of sulfide precipitation.

COMMENT NUMBER: 8-A-6
DOCKET NUMBER: LD12-00088
COMMENTER: INCO UNITED STATES, INC.
ISSUE: D007 (Chromium)
SUBISSUE: Treatment Standards
RESPONSE

The Agency acknowledges the commenter's remarks stating that the D007 nonwastewater standards should be based on the transfer of TCLP data from stabilization of F006 wastes rather than K062. EPA has reviewed all the D007 performance data submitted to the Agency during the comment period on the proposed D007 nonwastewater standard of 0.094. The Agency determined that the proposed D007 nonwastewater standard of 0.094 mg/l may not be routinely achievable for D007 waste matrices. Based on the data submitted, the Agency determined that a treatment standard of 4.3 mg/l may be more consistently achievable for most treaters of D007 wastes. Details on EPA's assessment of these data and calculation of a resultant treatment standard from these data are discussed in the Final BDAT Background Document for Chromium Wastes D007 and U032.

Although the data available to EPA show that a D007 nonwastewater treatment standard of 4.3 mg/l is achievable, EPA recognizes the diversity of wastes that quality as hazardous under the D007 classification. Because of this diversity, EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 wastes with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-7
Docket Number: LD12-00094
Commenter: TRICIL
Issue: 8 - Chromium (D007)
Subissue: TREATMENT STANDARDS
Comment:

D007 proposed BDAT limit for non-wastewaters is not achievable for all chromium waste streams.

TESI strongly urges U.S. EPA to set the D007 BDAT limit at the 5.2 mg/l limit discussed in the preamble. As previously discussed, all characteristic wastes received by TESI are treated so that the resultant residuals are non-hazardous. As such, all candidate waste streams are pretested and prequalified. With its many years of experience TESI must still reject some chrome streams as "untreatable" due to the presence of complexing agents and the concentration of chrome (in excess of 10,000 ppm). As the attached data shows, even with those chrome streams TESI does accept, a level of 0.094 mg/l is rarely achieved for a total extracted chromium concentration.

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E.P. TOXICITY

DATE	FINAL pH	Cd	Ni	Pb	Cr+6	Ba
		mg/l				
12/27/88	5.2	0.04	36.4	<0.2	<0.1	1.36
12/28/88	5.4	<0.04	22.4	1.38	<0.1	1.04
12/29/88	5.7	0.04	35.7	0.24	<0.1	1.42
01/04/89	5.0	0.02	39.4	<0.2	<0.1	1.22
01/05/89	5.2	0.04	22.3	<0.2	<0.1	1.08

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E.P. TOXICITY

DATE	FINAL pH	Cd	Ni	Pb	Cr+6	Ba	A
		mg/l					
01/10/89	5.6	0.20	32.5	0.2	<0.1	1.94	
01/11/89	5.4	0.14	38.9	0.2	<0.1	1.30	
01/12/89	5.2	0.06	65.4	<0.2	<0.1	0.74	
01/15/89	5.1	0.08	35.3	<0.2	<0.1	1.12	
01/16/89	5.1	0.09	41.9	<0.2	<0.1	1.53	
01/16/89	5.2	0.02	9.44	<0.2	<0.1	1.02	
01/17/89	5.0	0.04	25.6	<0.2	<0.1	1.40	
01/18/89	4.8	0.04	18.7	<0.2	<0.1	2.04	
01/19/89	5.3	0.02	16.3	<0.2	<0.1	2.10	
01/22/89	5.2	0.02	14.9	<0.2	<0.1	1.63	
01/24/89	5.1	0.04	24.3	<0.2	<0.1	1.18	
01/24/89	5.6	<0.02	18.8	<0.2	<0.1	1.48	
01/25/89	4.9	0.02	21.5	<0.2	<0.1	1.18	
01/26/89	4.9	0.04	11.2	<0.2	<0.1	1.58	<
01/29/89	5.0	0.04	31.3	0.2	<0.1	1.10	<
01/29/89	4.9	0.02	4.26	<0.2	<0.1	1.20	<

TRICIL

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E.P. TOXICITY

DATE	FINAL pH	Cd	Ni	Pb	Cr+6	Ba
		mg/l				
01/31/89	4.9	0.04	24.8	<0.2	<0.1	1.08
02/01/89	5.1	0.02	20.9	<0.2	<0.1	1.02
02/05/89	5.0	0.02	25.5	<0.2	<0.1	1.26

8-A-7

E.P. TOXICITY

DATE	FINAL pH	Cd	Ni	Pb	Cr+6	Ba
		mg/l				
01/31/89	4.9	0.04	24.8	<0.2	<0.1	1.08
02/01/89	5.1	0.02	20.9	<0.2	<0.1	1.02
02/05/89	5.0	0.02	25.5	<0.2	<0.1	1.26

TRICIL ENVIRONMENTAL SERVICES INC.
HILLIARD, OHIO

EP TOX METALS FOR DAILY SLUDGE ANALYSIS

2/07/89 - 2/26/89

DATE	Final pH	Cd	Cr	Ni	Pb	Ba	Ag
2/07/89	4.9	0.02	0.42	27.6	<0.20	1.32	0.06
2/08/89	4.8	0.04	0.36	33.2	<0.20	1.08	0.10
2/12/89	4.9	0.02	0.52	16.8	<0.20	0.94	<0.04
2/15/89	5.2	<0.02	<0.2	11.0	<0.20	0.78	0.04
2/19/89	5.1	0.02	1.0	24.9	<0.20	1.38	0.06
2/21/89	5.2	0.02	0.36	23.7	<0.20	1.28	0.04
2/22/89	5.1	<0.02	1.38	22.7	<0.20	0.88	0.10
2/22/89	5.1	0.04	2.98	31.1	<0.20	0.98	0.80
2/23/89	4.9	0.02	0.82	31.3	<0.20	2.16	0.04
2/26/89	5.2	0.02	0.50	16.9	<0.20	2.26	<0.04

DATE: January 4, 1990 RELEASED BY: ______________________
Nelson Wallis, Branch Manager

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TRICIL ENVIRONMENTAL SERVICES INC.
HILLIARD, OHIO
EP TOX METALS FOR DAILY SLUDGE ANALYSIS

3/06/89 - 3/30/89

DATE	Final pH	Cd	Cr	Ni	Pb	Ba	Ag
3/06/89	4.9	0.04	1.3	25.1	<0.20	0.69	0.06
3/06/89	5.0	0.04	1.1	27.5	<0.20	0.44	0.06
3/09/89	5.0	0.04	4.76	22.0	0.20	1.08	0.12
3/12/89	5.4	<0.02	4.68	49.9	<0.20	1.84	0.06
3/14/89	5.1	0.04	0.42	25.2	<0.20	0.82	0.12
3/15/89	4.8	0.02	0.1	30.5	0.20	0.54	0.14
3/15/89	5.1	0.02	4.56	33.4	<0.20	0.84	0.06
3/16/89	5.05	0.02	0.32	16.2	<0.20	1.58	0.12
3/20/89	5.2	0.04	0.50	13.6	<0.20	1.74	0.08
3/20/89	5.1	0.02	2.72	18.7	<0.20	1.76	0.10
3/20/89	5.1	0.04	3.52	13.1	<0.20	3.22	0.12
3/22/89	5.0	0.02	3.84	21.5	0.36	2.78	0.08
3/23/89	5.1	0.02	1.48	146	0.62	1.26	0.08
3/26/89	5.15	0.02	0.68	203	0.48	1.64	0.12
3/28/89	5.2	0.02	0.20	230	0.30	1.58	0.06
3/29/89	5.2	0.02	0.48	64.0	<0.20	1.2	0.08
3/30/89	5.1	0.02	0.28	60.2	<0.20	1.22	0.10

DATE: January 4, 1990 RELEASED BY: Nelson Wallis

Nelson Wallis, Branch Manager

LD12-00094
8-A-7

TRICIL ENVIRONMENTAL SERVICES INC.
HILLIARD, OHIO
EP TOX METALS FOR DAILY SLUDGE ANALYSIS

4/02/89 - 4/13/89

DATE	Final pH	Cd	Cr	Ni	Pb	Ba	Ag
4/02/89	5.1	0.02	1.10	43.4	<0.20	1.52	0.08
4/02/89	5.1	0.04	0.84	41.5	<0.20	1.48	0.08
4/02/89	5.1	0.04	1.94	51.0	<0.20	2.14	0.08
4/03/89	5.3	0.02	3.74	41.8	<0.20	2.54	0.08
4/05/89	5.2	0.04	4.60	23.3	<0.20	2.28	0.08
3/09/89	5.15	0.02	2.40	22.2	<0.20	1.84	0.06
4/11/89	4.9	0.04	1.20	27.2	<0.20	2.10	0.08
4/11/89	5.05	0.04	4.22	30.9	<0.20	2.34	0.08
4/11/89	5.0	0.02	4.46	27.3	<0.20	2.00	0.10
4/12/89	5.2	0.06	1.42	26.5	<0.20	1.38	0.08
4/13/89	5.2	0.04	1.64	22.8	<0.20	1.60	0.08

DATE: January 4, 1990

RELEASED BY:
Nelson Wallis, Branch Manager

ly

TRICIL ENVIRONMENATL SERVICES INC.
HILLIARD, OHIO

EP TOX METALS FOR DAILY SLUDGE ANALYSIS

04/16/89 - 05/16/89

DATE	pH	As	Ba	Cd	Cr	Pb	Hg	Se	Ag	Ni
04/16/89-I	4.9	<0.010	0.82	0.02	0.32	<0.2	0.0034	0.007	0.04	16.2
04/16/89-II	5.0	0.012	1.24	0.04	0.80	0.2	0.0032	0.006	<0.04	26.5
04/18/89	5.0	<0.010	0.96	0.02	0.60	<0.2	<0.0020	0.007	0.04	22.8
04/19/89	5.1	0.016	0.60	0.02	0.58	<0.2	<0.0020	0.008	0.16	18.3
04/20/89	5.0	<0.010	1.30	0.04	0.58	<0.2	<0.0020	0.005	0.14	13.8
04/23/89	4.9	0.004	1.84	0.02	2.76	<0.2	<0.002	0.008	0.06	17.0
04/25/89	4.9	<0.004	1.34	0.02	0.98	<0.2	<0.002	<0.004	<0.04	15.5
04/26/89	5.0	<0.004	1.40	<0.02	0.80	<0.2	<0.002	<0.004	0.04	15.7
04/27/89	5.0	<0.004	1.78	0.02	0.68	<0.2	<0.002	<0.004	<0.04	18.5
04/29/89	5.0	<0.004	1.58	0.04	2.34	0.2	<0.002	<0.010	0.08	20.4
05/02/89	5.2	0.006	1.68	0.04	1.60	<0.2	0.003	<0.020	0.06	47.6
05/03/89	5.2	<0.004	2.04	<0.02	4.66	<0.2	0.003	<0.020	0.06	29.7
05/07/89	5.2	<0.010	1.98	<0.02	4.92	<0.2	<0.002	<0.020	0.10	74.6
05/09/89	5.1	<0.010	1.26	0.04	0.90	<0.2	<0.002	<0.020	0.16	65.6
05/10/89	5.2	<0.010	1.54	0.02	1.04	<0.2	<0.002	<0.010	0.08	44.8
05/11/89	5.2	<0.010	1.20	<0.02	0.50	<0.2	<0.001	<0.010	0.08	43.2
05/14/89	5.2	<0.010	1.58	0.02	1.30	<0.2	<0.001	<0.020	0.12	74.7
05/16/89	5.0	<0.010	0.64	<0.02	1.32	<0.2	<0.001	<0.020	0.06	51.0

LD12-00094
8-A-7

LD121-00094
8-A-7

EP TOX METALS FOR DAILY SLUDGE ANALYSES

LAST 9 DAYS IN MAY, 1989

DATE	FINAL pH	CADMIUM (mg/1)	CHROMIUM (mg/1)	NICKEL (mg/1)	LEAD (mg/1)	BARIUM (mg/1)	SILVE (mg/1
5/17/89	5.15	<0.02	1.26	50.1	<0.2	0.70	0.0
5/18/89	5.10	<0.02	1.86	67.8	<0.2	1.34	0.1
5/22/89	5.0	0.04	0.86	67.7	<0.2	0.98	0.1
5/23/89	5.0	<0.02	1.04	47.4	<0.2	1.0	0.1
5/24/89	4.8	0.02	0.92	66.9	<0.2	0.52	0.0
5/25/89	5.5	0.02	0.98	61.3	<0.2	0.88	0.0
5/27/89	5.1	0.04	0.40	25.2	<0.2	0.60	0.1
5/30/89	5.0	0.02	0.38	8.48	<0.2	0.62	<0.0
5/31/89	5.0	<0.02	2.10	26.7	<0.2	0.70	0.0

DATE: August 10, 1989

RELEASED BY: Ron Allerton
Ron Allerton, Ph.D.
Laboratory Services Manager

LD12-00094
8-A-7

EP TOX METALS FOR DAILY SLUDGE ANALYSES
JUNE 1989

DATE	FINAL pH	CADMIUM (mg/1)	CHROMIUM (mg/1)	NICKEL (mg/1)	LEAD (mg/1)	BARIUM (mg/1)	SI (m
6/01/89	5.0	0.02	0.94	40.8	<0.2	0.40	<C
6/04/89	5.0	0.02	1.36	28.9	<0.2	0.58	<0
6/06/89	5.1	<0.02	2.46	36.1	<0.2	0.54	<0
6/07/89	5.0	<0.02	1.06	28.5	<0.2	0.64	<0
6/08/89	5.2	0.04	1.48	26.9	0.20	0.72	0
6/11/89	4.8	0.02	1.68	12.4	<0.2	0.90	0.
6/13/89	5.0	0.08	1.00	24.2	<0.2	1.14	<0.
6/14/89	5.1	<0.02	2.38	45.3	<0.2	0.06	0.
6/15/89	5.0	0.04	1.28	47.3	<0.2	0.56	0.
6/18/89	5.1	<0.02	0.48	18.6	<0.2	0.80	0.
6/20/89	5.2	0.02	<0.2	27.5	<0.2	0.48	0.
6/21/89	5.3	0.04	0.60	19.5	<0.2	0.78	0.
6/22/89	5.0	0.02	2.24	29.2	<0.2	0.78	0.
6/24/89	5.5	0.06	0.78	29.4	<0.2	1.22	< 0.
6/27/89	5.1	<0.02	2.68	81.9	<0.2	0.84	0.
6/28/89	5.0	<0.02	0.68	116.9	<0.2	0.72	<0.
6/29/89	5.1	<0.02	0.26	45.7	<0.2	0.68	0.

DATE: August 10, 1989 RELEASED BY: Ron Allerton

Ron Allerton, Ph.D.
Laboratory Services Manager

LD12-00094
8-A-7

EP TOX METALS FOR DAILY SLUDGE ANALYSES
JULY 1989

DATE	FINAL pH	CADMIUM (mg/l)	CHROMIUM (mg/l)	NICKEL (mg/l)	LEAD (mg/l)	BARIUM (mg/l)	SI (m
7/02/89	5.1	0.04	1.24	40.6	<0.2	0.98	0.
7/05/89	5.2	0.04	0.66	49.2	0.22	0.84	<0
7/06/89	5.2	0.02	0.78	26.5	0.22	1.06	0.
7/10/89	5.2	<0.02	1.26	18.3	<0.2	1.10	<0.
7/11/89	5.2	0.02	0.96	28.6	<0.2	0.82	0.
7/12/89	5.1	0.04	0.38	122.1	<0.2	1.66	<0.
7/13/89	5.1	0.04	0.36	77.2	<0.2	0.58	<0.
7/16/89	5.2	0.06	3.16	12.8	0.30	0.64	0.
7/18/89	5.2	0.04	0.96	18.4	0.24	0.94	<0.
7/19/89	4.9	0.04	0.60	15.1	<0.2	0.63	<0.
7/20/89	5.1	0.02	0.28	28.3	<0.2	0.94	<0.
7/24/89	5.1	0.02	0.78	16.9	<0.2	0.78	0.
7/25/89	5.2	<0.02	<0.2	34	<0.2	0.64	<0.
7/26/89	5.2	0.02	0.60	69.6	<0.2	1.58	<0
7/27/89	5.2	0.02	2.08	65.3	0.22	1.42	0.

DATE: August 10, 1989 RELEASED BY: Ron Allerton

Ron Allerton, Ph.D.
Laboratory Services Manager

LD12-00094
8-A-7

TRICIL ENVIRONMENTAL SERVICES INC.
HILLIARD, OHIO
EP TOX METALS FOR DAILY SLUDGE ANALYSIS

08/07/89 - 08/31/89

DATE	Final pH	Cd	Cr	Ni	Pb	Ba	Ag
08/07/89	4.9	0.02	2.74	42.8	<0.20	0.90	<0.04
08/08/89	4.9	0.02	4.16	19.9	<0.20	1.38	0.04
08/09/89	5.8	0.02	4.62	16.3	<0.20	0.92	0.04
08/10/89	5.8	0.02	2.12	14.7	<0.20	1.82	<0.04
08/14/89	5.1	0.04	1.82	35.7	0.34	1.80	<0.04
08/15/89	5.2	0.04	1.44	47.4	0.20	1.38	0.08
08/16/89	5.2	0.06	1.86	68.8	0.26	1.42	0.06
08/17/89	5.6	0.18	0.48	38.4	<0.20	1.34	<0.04
08/21/89	5.1	0.08	0.96	35.0	0.24	0.78	<0.04
08/22/89	6.8	0.02	0.24	14.0	0.38	1.38	<0.04
08/23/89	6.5	0.02	0.28	11.2	0.32	1.88	<0.04
08/24/89	5.1	0.08	2.0	22.8	<0.20	1.54	<0.04
08/28/89	5.0	0.10	0.50	24.1	0.22	1.04	0.04
08/29/89	5.4	0.04	0.28	36.4	<0.20	1.88	0.06
08/31/89	5.4	0.12	0.70	30.5	0.26	1.54	0.06

DATE: October 2, 1989 RELEASED BY: Ron Allerton

Ron Allerton, Ph.D.
Laboratory Services Manager

LD12-00094

8-A-7

TRICIL ENVIRONMENTAL SERVICES INC.
HILLIARD, OHIO
EP TOX METALS FOR DAILY SLUDGE ANALYSIS

08/07/89 - 08/31/89

DATE	Final pH	Cd	Cr	Ni	Pb	Ba	Aq
08/07/89	4.9	0.02	2.74	42.8	<0.20	0.90	<0.04
08/08/89	4.9	0.02	4.16	19.9	<0.20	1.38	0.04
08/09/89	5.8	0.02	4.62	16.3	<0.20	0.92	0.04
08/10/89	5.8	0.02	2.12	14.7	<0.20	1.82	<0.04
08/14/89	5.1	0.04	1.82	35.7	0.34	1.80	<0.04
08/15/89	5.2	0.04	1.44	47.4	0.20	1.38	0.08
08/16/89	5.2	0.06	1.86	68.8	0.26	1.42	0.06
08/17/89	5.6	0.18	0.48	38.4	<0.20	1.34	<0.04
08/21/89	5.1	0.08	0.96	35.0	0.24	0.78	<0.04
08/22/89	6.8	0.02	0.24	14.0	0.38	1.38	<0.04
08/23/89	6.5	0.02	0.28	11.2	0.32	1.88	<0.04
08/24/89	5.1	0.08	2.0	22.8	<0.20	1.54	<0.04
08/28/89	5.0	0.10	0.50	24.1	0.22	1.04	0.04
08/29/89	5.4	0.04	0.28	36.4	<0.20	1.88	0.06
08/31/89	5.4	0.12	0.70	30.5	0.26	1.54	0.06

DATE: October 2, 1989 RELEASED BY:

Ron Allerton, Ph.D.

LD12-00094

8-A-7

TRICIL ENVIRONMENTAL SERVICES INC.
HILLIARD, OHIO
EP TOX METALS FOR DAILY SLUDGE ANALYSIS

09/05/89 - 09/28/89

DATE	Final pH	Cd	Cr	Ni	Pb	Ba	Ag
09/05/89	5.6	0.12	0.64	22.8	0.20	1.78	0.04
09/06/89	5.9	0.04	2.2	31.6	0.26	1.56	0.06
09/07/89	4.8	0.04	2.5	16.2	0.36	1.48	0.04
09/11/89	5.0	0.02	4.14	12.0	<0.20	1.42	<0.04
09/12/89	6.4	<0.02	<0.20	3.8	0.24	1.88	0.06
09/13/89	5.3	0.14	1.34	17.0	<0.20	0.64	0.04
09/14/89	5.1	0.10	3.34	15.3	<0.20	1.58	0.06
09/18/89	5.2	0.04	2.80	17.4	<0.20	0.74	<0.04
09/20/89	5.0	0.06	1.18	22.6	<0.20	1.12	0.10
09/21/89	4.8	0.02	1.66	24.6	<0.20	0.78	<0.04
09/25/89	5.2	0.04	0.36	24.8	0.24	0.86	<0.04
09/27/89	5.2	0.02	3.08	32.8	<0.20	1.04	0.04
09/28/89	5.3	0.04	0.72	17.6	<0.20	1.64	<0.04

DATE: October 2, 1989 RELEASED BY:

Ron Allerton, Ph.D.
Laboratory Services Manager

TRICIL ENVIRONMENTAL SERVICES INC.
HILLIARD, OHIO
EP TOX METALS FOR DAILY SLUDGE ANALYSIS

10/02/89 - 10/30/89

DATE	Final pH	Cd	Cr	Ni	Pb	Ba	Ag
10/02/89	5.0	0.22	0.32	19.3	<0.20	0.80	0.06
10/04/89	5.0	0.10	0.50	33.6	<0.20	1.80	0.10
10/05/89	5.1	0.06	0.84	34.1	0.22	1.56	0.12
10/09/89	5.6	0.04	0.66	24.9	<0.20	2.18	0.04
10/11/89	5.2	0.06	2.5	19.7	<0.20	1.46	0.04
10/12/89	5.2	0.24	3.4	10.3	<0.20	0.54	<0.04
10/16/89	5.2	0.06	0.64	27.0	0.22	1.34	0.04
10/18/89	4.9	0.02	4.86	14.7	<0.20	2.22	<0.04
10/19/89	5.3	0.04	2.20	6.70	<0.20	2.04	0.04
10/23/89	6.0	0.04	0.36	9.14	<0.20	2.50	<0.04
10/25/89	5.0	0.02	1.32	23.1	0.26	1.68	<0.04
10/26/89	5.1	0.04	4.70	16.6	<0.20	1.78	0.06
10/30/89	5.0	0.06	1.68	14.0	<0.20	2.00	0.04

DATE: November 1, 1989

RELEASED BY: Ron Allerton
Ron Allerton, Ph.D.
Laboratory Services Manager

8-A-7

LD12-00094

COMMENT NUMBER: 8-A-7
DOCKET NUMBER: LD12-00094
COMMENTER: Tricil
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency thanks the commenter for their remarks and the EP toxic data for analysis of the treated D007 streams received by the commenter. These data were not considered for determining an achievable treatment standard as they provided no untreated concentration nor Quality Assurance/Quality Control (QA/QC) information. Although the data were deficient in the above-mentioned criteria, the Agency calculated a treatment standard of 12.0 mg/l (EP toxicity) based on these data. These data show a range of treated values from <0.1 to 4.9 mg/l (EP toxicity). Although these data are incomplete in information meeting the BDAT standards for data quality, the treated values are suggestive of the difficulties in treating certain D007 waste matrices.

EPA has reviewed all the D007 performance data submitted to the Agency (during the comment period) on the proposed D007 nonwastewater standard of 0.094 mg/l. Accordingly, the Agency determined that a D007 nonwastewater standard of 4.3 mg/l may be more consistently achievable for most treaters of this waste than the proposed D007 nonwastewater standard of 0.094 mg/l. Details on EPA's assessment of these data and calculation of a resultant treatment level from these data are discussed in the Final BDAT Background Document for Chromium Wastes D007 and U032.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable, EPA recognizes the diversity of wastes that qualify as hazardous under D007 classification. Because of this diversity, EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even

COMMENT NUMBER: 8-A-7 (continued)
DOCKET NUMBER: LD12-00094
COMMENTER: Tricil
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

the most difficult to treat D007 wastes with the exception of wastes in the inorganic solid debris treatability group, can be treated to this level.

Particular points noted by the Agency are (1) the commenter is a member of the treatment industry but believes that only a treatment standard above the characteristic level is appropriate due to the diversity of waste types involved; (2) the commenter rejects some D007 waste as untreatable due to the presence of complexing agents.

Comment Number: 8-A-8
Docket Number: LD12-L0002
Commenter: American Wood Preservers Institute
Issue: 8-Chromium (D007)
Subissue: Treatment Standards
Comment:

EPA'S PROPOSED STANDARDS

The Agency has proposed a BDAT treatment standard of .094 mg/l for D007 (chromium-containing) expressed as an analysis of the TCLP extracts. This level is based on the performance of chromium reduction followed by a lime and sulfide precipitation and dewatering for K062[4] wastes. It should be noted that this level is below current extraction procedure toxicity levels. Although EPA asserts that it has the authority to set land disposal restriction limits lower than hazardous waste threshold designations because the land disposal restriction standard is technology-based and not health-based, it is AWPI/SAWP's understanding that Subtitle C exerts no authority when a solid waste not listed as hazardous does not exhibit any characteristic of hazardous waste. It is our view, further, that the issue of whether a standard is health-based or technology-based should be moot once the health-based limits are achieved. There is no demonstrated or rational need for the Agency to exceed established levels beyond which a material no longer poses a risk to human health or the environment.

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[4] K062 is defined in 40 CFR 261.33 as "spent pickle liquor generated by steel finishing operations ....."

Comment Number: 8-A-8 (Con't)
Docket Number: L012-L002
Commenter: American Wood Preservers Institute
Issue: 8 - Chromium (D007)
Subissue: Treatment Standards
Comment:

EPA in its proposal, is specifically soliciting comments and treatment data from industry on whether the proposed treatment standard is achievable for all D007 non-wastewaters. EPA also notes that if comments indicate that the standard is not achievable, the Agency may promulgate a 5.2 mg/l standard-based on a transfer of F006[5]/ treatment standards. AWPI has researched the matter, having contacted representatives of the treatment, storage and disposal (TSD) facilities currently accepting D004 and D007 wood preserving wastes. Although there are indications from bench scale tests that at least the F006 standards for chromium wastes may be achievable, there are no data from wood treaters, chemical suppliers, or treatment and disposal facilities to indicate that the levels proposed by EPA are achievable on a regular basis for typical arsenical and chromium wood preserving wastes.

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[5]/ F006 is defined in 40 CFR 261.31 as "wastewater treatment sludges from electro-plating operations ...."

Comment Number: 8-A-8 (Con't)
Docket Number: LD12-L0002
Commenter: American Wood Preservers Institute
Issue: 8-Chromium (D007)
Subissue: Treatment Standards
Comment:

There are significant differences between K062 wastes used to establish the basis for EPA's treatment standard, and typical chromium-containing wood preserving wastes. We can understand EPA's reliance on K062 treatment data. It is an ideal waste on which to base a generic standard because it is fairly consistent in its composition. K062 -- spent pickle liquor generated by steel finishing operations -- is typically a clear liquid containing very few, if any solids; it is typically either hydrochloric acid or sulfuric acid containing trivalent chromium and a variety of metal chlorides or metal sulfates (e.g., ferrous chloride, chromium chloride, nickel chloride, ferrous sulfate, chromium sulfate, nickel sulfate.) In addition, it can be assumed that there is a significant body of data for EPA to draw upon, recognizing that this would not only be a toxic waste, but clearly, a highly corrosive waste because of the acid base. Again, this clear liquid, free of substantial solids, would respond quite favorably to straight line precipitation of the metals through the simple addition of lime or another alkaline compound.

Comment Number: 8-A-8 (Cont)
Docket Number: LD12-LD002
Commenter: American Wood Preservers Institute
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

D007, as generated by the wood preserving industry, typically consists of 3 to 4 percent chromated copper arsenate (CCA) and 96 to 97 percent debris. The chromium found in this material is in the trivalent form, typically from 6,000 to 20,000 ppm. The bulk of the disposed waste (the 96 to 97 percent) is comprised of dust, soil, wood chips, sawdust, and miscellaneous debris. We are concerned with the interference potential in attempted stabilization/ treatment because of the large volume of ill-defined organics. In order to imitate the K062 treatment process, as suggested by the Agency, the interference potential must be minimized or eliminated. Therefore, the generally dry alkaline wood treating waste material would have to be put into a clear, heavily acid solution. This would indicate the necessity for dilution -- a step generally deemed both undesirable and impermissible by the Agency and the Congress. Then, the question of dealing with the suspended solids in the liquid must be addressed with some elaborate filtration mechanism. Next, the organics must be accounted for or removed from the treatment process. To achieve sufficient stabilization, the combination of wood constituents, soil, and miscellaneous debris must be dealt with. Finally, and perhaps most critically, the pH of the material must be adjusted in preparation for the stabilization of the waste.

Comment Number: 8-A-8 (Con't)
Docket Number: LD12-L0002
Commenter: American Wood Preservers Institute
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

First, recognizing that the solubility of chromium decreases with increasing pH (i.e., for chromium, minimizing solubility requires alkaline conditions) and solubility of arsenic, which is not separated from the chromium wastes, decreases with increasing alkalinity until a pH of 9 is achieved. At that point, the arsenic would go back into solution. And so for arsenic, minimizing solubility requires neutral conditions. These two conflicting factors presented by D004/D007 wood preserving wastes are not addressed in the treatment method specified for K062. We conclude that transfer of this technology as a basis for setting concentration limits for land disposal of wood preserving wastes is inappropriate.

Comment Number: 8-A-8 (Con't)
Docket Number: LD12-L0002
Commenter: American Wood Preservers Institute
Issue: 8- Chromium (D007)
Subissue: Treatment standards
Comment:

On the other hand, the D007 wastes generated by the wood preserving industry at least resemble F006 wastes in some critical respects. F006 wastes are defined by EPA as wastewater treatment sludges from certain electro-plating operations. These electroplating wastes typically contain chelating agents and other organics; again, at least making them somewhat similar in nature to wood preserving wastes. Therefore, because of the significant differences between K062 and CCA (D004/D007) wood treating wastes, as well as the lack of data on the treatability of wood preserving wastes to the extraordinarily low levels specified for chromium, AWPI/SAWP recommend that the Agency promulgate a 5.2 mg/l BDAT treatment standard for chromium based on a transfer of the stabilization performance of F006 wastes. We believe that, although data do not appeart to exist, this standard is more readily achievable and would be protective of human health and the environment as determined by the toxicity characteristic leaching method. Regulatory consistency would also add to the credibility of the BDAT levels proposed for both arsenic and chromium. We further note that proposed BDAT treatment standards for multisource leachate[6]/ are 5.6 mg/l for arsenic and 5.0 mg/l for chromium. These levels are relevant to, and consistent with current EP toxicity levels and proposed TCLP levels for determining whether a solid waste exhibits a characteristic of 'hazardousness'.

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[6]/ See 54 Fed. Reg. 48466

COMMENT NUMBER: 8-A-8
DOCKET NUMBER: LD12-L0002
COMMENTER: American Wood Preservers Institute
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE:

The Agency's response to the legal aspects of regulating characteristic waste is discussed in the preamble to today's final rulemaking.

The Agency acknowledges the commenter's remarks stating that there are significant differences between K062 waste used to establish the proposed D007 nonwastewater standards and typical D007-chromium-containing waste from the wood preserving industry.

EPA decided that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out that the D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters. Based on the limited data submitted during the comment period, the Agency calculated a treatment standard of 4.3 mg/l for D007 nonwastewaters. The bulk of the submitted data did not meet EPA's criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularily untreated TCLP for corresponding treated TCLP concentrations; most of the commenters failed to provide untreated data, 2) no Quality Control/ Quality Assurance (QA/QC) data and, 3) lack of design and operations information. Therefore, the Agency rejected many of these data for

COMMENT NUMBER: 8-A-8 (continued)
DOCKET NUMBER: LD12-L0002
COMMENTER: American Wood Preservers Institute
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE:

consideration of a standard. As a result, the data evaluated to determine a 4.3 mg/l treatment level represent only a small fraction of the total data received on treatment of D007 wastes. Details on assessment of these data is presented in the Final Best Demonstrated Available Technology Background Document (BDAT) for Chromium Wastes D007 and U032.

Although most of the data were not considered for calculating a treatment standard, the data did suggest much variability in treatment for D007 nonwastewaters. Many commenters expressed concerns that due to the fact that D007 waste matrices are so diverse (i.e., high total chromium concentrations, higher concentrations of hexavalent chromium, and the presence of complexing agents in some D007 waste streams), the diversity will prevent them from routinely achieving the proposed standard of 0.094 mg/l for D007 nonwastewaters. Some commenters suggested that even the alternate standard of 5.2 from the stabilization of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters (as noted above), EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3(a)(2) of today's Final Third Third Rule) can be treated to this level.

Comment Number: 8-A-9
Docket Number: LD12-00246
Commenter: Chem Met Services, Inc
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

We feel the treatment standards for D007 non-wastewaters at .094 mg/l is too stringent. We do not feel this level is achievable at a commercial facility where mixed wastes containing D007-Chromium are present. We do believe the F006 standard at 5.2 mg/l is reasonable. It appears on the basis of comments on page 48437 of the November 22 Federal Register that the lower treatment standard of .094 mg/l was taken from K062 sludge which may or may not contain chromium at levels that needed stabilization. We agree however, many characteristic waste streams with chromium contamination are at levels far exceeding those found in the K062 sludge and F006 is a good representative of this type and potential concentrations. An old summary from a Chemfix presentation of 12/87 is attached showing the average chromium concentration of 4035 mg/kg and a high of 709,970 mg/kg. This may be old news but it clearly shows levels far exceeding the average found in K062 waste sludges.

It is our recommendation that the agency leave the chromium treatment standard for D007 non-wastewater at 5.2/mg/l on the basis that this characteristic waste is more similiar to F006 than it is to K062 and at a level that is reasonably reachable at a commercial facility.

LV12-00246.A
8-A-9

"CALIFORNIA LIST" METALS DATABASE SUMMARY

CONSTITUENTS OF CONCERN	NUMBER OF SAMPLES	TOTAL CONC. (AVERAGE) mg/kg	STATUTORY LEVELS + mg/l	HEALTH BASED STANDARDS mg/l (HBS)	LEACHATE CONCENTRATIONS IN EP EXTRACTS OF CHEMFIX PRODUCT / COMPARED TO HEALTH BASED STANDARD (HBS)		
					LESS THAN 1X HBS*	LESS THAN 10X HBS	LESS THAN 100X HBS**
ARSENIC	229	<0.01 - 2000 (Avg.= 34.47)	500	0.05	101 (44%)	217 (95%)	227 (99%)
CADMIUM	243	0.01 - 98000 (Avg.= 643.9)	100	0.01	13 (5%)	208 (86%)	232 (95%)
CHROMIUM	253	0.03 - 709970 (Avg.= 4035.1)	500	0.05	62 (25%)	231 (91%)	247 (98%)
LEAD	258	0.1 - 96200 (Avg.= 1879.6)	500	0.05	6 (2%)	213 (83%)	253 (98%)
MERCURY	188	0.005 - 37200 (Avg.= 43.70)	20	0.002	34 (18%)	105 (56%)	183 (97%)
NICKEL	234	0.05 - 37320 (Avg.= 588.4)	134	0.34	169 (72%)	229 (98%)	234 (100%)
SELENIUM	201	<0.01 - 80.0 (Avg.= 6.89)	100	0.01	40 (20%)	143 (71%)	199 (99%)
THALLIUM	N.A.	N.A.	130	0.01	N.A.	N.A.	N.A.

N.A. : Sample not anlayzed for constituent.
+ : Statutory levels are based on the "California Metal List" published on the HSWA 1984.
* : 1 time health based standard equivalent to drinking water standard.
** : 100 times health based standard equivalent to EP toxicity standard.

:wks
12/87

COMMENT NUMBER: 8-A-9
DOCKET NUMBER: LD12-00246
COMMENTER: Chem Met Services, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE:

The Agency acknowledges the commenter's remarks stating that the 0.094 mg/l treatment standard for D007 nonwastewaters are too stringent and not achievable at a commercial facility due to the vast differences in the waste matrices versus the K062 nonwastewater from which the proposed standards were based. As such, the commenter believed that the standard should be based on the F006 data (i.e., 5.2 mg/l) that the Agency proposed to use to develop the alternate D007 nonwastewater standard. The commenter is another member of the treatment industry stating that due to the great diversity of the waste types encompassed by the characteristic waste code, an achievable standard would exceed the characteristic level.

EPA decided that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo metallic wastes. The Agency received many comments pointing out that the D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters. Based on the data submitted during the comment period, the Agency calculated a treatment standard of 4.3 mg/l for D007 nonwastewaters. The bulk of these data did not meet EPA's criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularily untreated TCLP for corresponding treated TCLP concentrations; most of the commenters failed to provide untreated data, 2) no Quality Assurance/ Quality Control (QA/QC) data, and 3) lack of design and operations

COMMENT NUMBER: 8-A-9 (continued)
DOCKET NUMBER: LD12-00246
COMMENTER: Chem Met Services, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

information. Therefore, the Agency rejected much of these data for consideration of a standard. As a result, the data evaluated to determine 4.3 mg/l treatment level represent only a small fraction of the total data received on treatment of D007 wastes. Details on assessment of these data is presented in the Final Best Demonstrated Available Background Document (BDAT) for Chromium Wastes D007 and U032.

Although these data were not considered for calculating a treatment standard, the data did suggest much variability in treatment for D007 nonwastewaters and are suggestive of the difficulties in treating some D007 waste matrices. Many commenters expressed concerns that due to the fact that D007 waste matrices are so diverse (i.e., high total chromium concentrations, higher hexavalent chromium concentrations, and the presence of complexing agents in some D007 waste streams), the diversity will prevent them from routinely achieving the proposed standard of 0.094 mg/l for D007 nonwastewaters. Some commenters suggested that even the alternate D007 nonwastewaters standard of 5.2 from treatment of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters, at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of the D007 subcategory i.e., refractory brick and other wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule) can be treated to this level.

Comment Number: 8-A-10
Docket Number: LD12-00110
Commenter: Thermal KEM / CyanoKEM
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

D007 Chromium Wastes

CyanoKEM has provided comments in a comprehensive data package submitted December 22, 1989 on the EPA's proposed standards for D007 waste. We feel that the technology transfer from K062 is inappropriate since the waste matrix for what is typically found for D007 waste streams is vastly different from K062. We feel that the proposed non-wastewater treatment standard of 0.094 mg/liter is not achievable on a routine basis, but that a standard in the range of 0.3 to 0.8 mg/liter represents the treatability of D007 streams. More detailed explanation of these matrix differences is provided in the December 22, 1989 report submitted to the LD12 docket.

In addition, we provided the EPA a data set that represents treatment of D007 waste on a full scale basis.

We request that EPA re-evaluate BDAT for chromium in D007 waste, and set the treatment standards on the basis of data provided here, and not based on previous work done on K062 waste which is vastly different from D007. Finally, we do not feel that the treatment standard should be technology transferred from F006, and we are in agreement with EPA's arguments presented in the preamble to the proposed rule.

The BDAT standard proposed by EPA is inappropriate for D007 waste. The reasons are primarily the vast differences in the matrices for these wastes, versus the K062 waste that the proposed standard is technology transferred from. (See Docket Document No. LDR7-S0348)

First, K062 wastes are aqueous liquids comprised of 93% water, and are comprised of just a few simple major components, usually either sulfuric or hydrochloric acid, and iron salts. The solids content of these wastes rarely exceeds 0.5%. The waste rarely exceeds levels of 3000 PPM chromium. For example, the non-wastewater K062 streams evaluated by EPA averaged 1500 PPM chromium to begin with, and ranged in concentration from 396 to 7000 PPM. (See Tables 2.7 and 2.8 in Docket Document LDR7-S0348).

Comment Number: 8-A-10 (con't)
Docket Number: LD12-00110
Commenter: Thermal KEM/ CyanoKEM
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

In contrast, the D007 waste streams represent a wide variety of physical forms and matrices. Many D007 waste streams are solids and sludges, not liquids like K062, and are comprised of less than 50% water. The solids content often exceeds 30%. In addition, D007 waste tend to be much higher in chromium concentration. Chromium levels of 20,000 to 80,000 PPM in D007 waste are quite routine, and typically average around 30,000 PPM. The background document written by EPA for development of BDAT for chromium waste D007 (Docket Document No. LD12-S1050) confirms the information we are presenting here, that D007 waste can contain as high as 700,000 PPM chromium, and consist of solids, sludges as well as liquids. In contrast, the untreated K062 waste on which BDAT is based averages only 1500 PPM Cr (See Table 5-2, page 5-5 of EPA's chromium BDAT background document - Docket #LD12-S1050).

For these D007 waste streams we find that the higher concentration of chromium coupled with the more complex physical and chemical matrix makes these more difficult to treat than the K062 waste streams from which EPA tech transferred the BDAT standard. The non-wastewater treatment standard should really be set in the range of 0.3 to 0.8 PPM, not at 0.094 PPM. CyanoKEM has presented data on chromium reduction, followed by precipitation, vacuum filtration and stabilization of the non-wastewater residuals remaining. We urge EPA to consider this data in setting more appropriate BDAT treatment standards.

We do not feel that the EPA should promulgate the F006 standard as an alternative, and agree with EPA's comments on the inappropriateness of this technology transfer. We also do not feel that K062 is appropriate, and have presented data to the docket on December 22, 1989 to provide EPA a data set that is truly based on the restricted waste D007.

COMMENT NUMBER: 8-A-10
DOCKET NUMBER: LD12-00110
COMMENTER: ThermalKEM/CyanoKEM
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency acknowledges the commenter's remarks which are in essence the same comment submitted by CyanoKEM see comment number (8-A-1). The commenter states that the 0.094 mg/l treatment standard for D007 nonwastewaters are not routinely achievable due to the vast differences in the waste matrices versus the K062 waste from which the proposed standards were based. The commenter is therefore, requesting that the Agency develop a treatment standard for D007 nonwastewaters in the range of 0.3 to 0.8 based on data submitted by CyanoKEM (See LD12-00020). The Agency notes that the Hazardous Waste Treatment Council (HWTC) in its reply comments, read the record data to justify a standard of 2.1 mg/l.

EPA decided that the proposed nonwastewater treatment standard based on K062 data (which is essentially wastewater treatment data) may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out the much D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters. Based on the data submitted during the comment period, the Agency calculated a treatment standard of 4.3 mg/l for D007 nonwastewaters. The bulk of these data submitted during the comments period did not meet EPA's criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularly untreated TCLP for corresponding treated TCLP concentrations; most of the

COMMENT NUMBER: 8-A-10 (continued)
DOCKET NUMBER: LD12-00110
COMMENTER: ThermalKEM/CyanoKEM
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

commenters failed to provide the untreated values 2) no Quality Control/Quality Assurance (QA/QC) data and 3) lack of design and operations information of D007 wastes. Therefore, the Agency rejected these data for consideration of a standard. The data evaluated to determine 4.3 mg/l treatment level represents only a small fraction of the total data received on treatment of D007 wastes. Details on assessment of these data is presented in the Final Best Demonstrated Available Background Document (BDAT) for Chromium Wastes D007 and U032.

Although these data were not considered for calculating a treatment standard, the data did suggest much variability in treatment for D007 nonwastewaters and many commenters expressed concerns that due the fact that D007 waste matrices are so diverse, (i.e., high total chromium concentrations, higher hexavalent chromium concentrations, and the presence of complexing agents in some D007 waste streams) that the diversity will prevent them from routinely achieving the proposed D007 nonwastewater standard of 0.094. Some commenters suggested that even the alternate standard, i.e., 5.2, from the stabilization of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP

COMMENT NUMBER: 8-A-10 (continued)
DOCKET NUMBER: LD12-00110
COMMENTER: ThermalKEM/CyanoKEM
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

leachate and wastewaters at 5.0 mg/l total concentration. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-11
Docket Number: LD12-D0113
Commenter: Michigan Disposal, Inc.
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

D007 Chromium Wastes: The Agency has quite unrealistically proposed treatment standards which are about 50 times lower than the EP toxic level. These could neither be attained by the stabilization nor the incineration of wastes.

The proposal states BDAT is based upon chromium reduction followed by lime and sulfide precipitation. In solid waste treatment sulfide precipitation has limited application. The reaction product using sulfide on chromium wastes at high pH is not an insoluble chromium sulfide but insoluble chromium III hydroxide; Cr(OH)3. The sulfide either remains a free and potentially reactive constituent in the residual or may combine with other metal species present. Further examination of the Agency's study design and basic premises are necessary in this case.

Especially in treatment of mixed characteristic wastes the results from stabilization are far superior to those produced using tank treatment methods. This is illustrated in treatment of a chromium waste bearing cyanide and arsenic. Cyanides are oxidized by alkaline chlorination (pH >10) but to oxidize any organic arsenic addition of permanganate or peroxides is required at a low pH. In such cases chromium reduction is not possible using wastewater treatment methods but stabilization is effective because it will act upon chromium and arsenic regardless of their oxidation state.

COMMENT NUMBER: 8-A-11
DOCKET NUMBER: LD12-00113
COMMENTER: Michigan Disposal, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency acknowledges the commenter's remarks stating that the 0.094 mg/l proposed treatment standard for D007 nonwastewaters are unrealistically too low and are unachievable.

EPA decided that the proposed nonwastewater treatment standard based on K062 data (which is essentially wastewater treatment data) may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out the much D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters. Based on the data submitted during the comment period, the Agency was able to calculate a treatment standard of 4.3 mg/l for D007 nonwastewaters.

Details on the assessment of the D007 treatment performance data submitted to the Agency during the comment period may be found in the Final Best Demonstrated Available Technology (BDAT) Background Document for Chromium Wastes D007 and U032.

After review of all the treatment performance data and comments received for D007 wastes, the Agency believes that there are vast differences in the K062 (from which the proposed standard was transferred) waste and D007 waste.

COMMENT NUMBER: 8-A-11 (continued)
DOCKET NUMBER: LD12-00113
COMMENTER: Michigan Disposal, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

Because of this diversity i.e., high total chromium content, high hexavalent chromium concentration, and the presence of complexing agents many commenters believed that the proposed D007 nonwastewater standard of 0.094 mg/l may not be routinely achievable. This position was supported by the vast majority of the commenters.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule) can be treated to this level.

The commenter also expressed concerns that an arsenic and chromium containing waste may be unique. The commenter implies that it may not be as treatable as other D007 wastes using the technology upon which EPA based its treatment standard development.

The commenter is reminded that treaters of D007 wastes may use whatever technology necessary to achieve the concentration-based standards. If the commenter believes that their waste still cannot meet the standards they may petition EPA for a treatment variance.

Comment Number: 8-A-12
Docket Number: LD12-00130
Commenter: WAYNE DISPOSAL. INC
Issue: 8- Chromium (D007)
Subissue: Treatment standards
Comment:

D007 Chromium Wastes: The Agency has quite unrealistically proposed treatment standards which are about 50 times lower than the EP toxic level. These could neither be attained by the stabilization nor the incineration of wastes.

The proposal states BDAT is based upon chromium reduction followed by lime and sulfide precipitation. In solid waste treatment sulfide precipitation has limited application. The reaction product using sulfide on chromium wastes at high pH is not an insoluble chromium sulfide but insoluble chromium III hydroxide; Cr(OH)3. The sulfide either remains a free and potentially reactive constituent in the residual or may combine with other metal species present. Further examination of the Agency's study design and basic premises are necessary in this case.

Especially in treatment of mixed characteristic wastes the results from stabilization are far superior to those produced using tank treatment methods. This is illustrated in treatment of a chromium waste bearing cyanide and arsenic. Cyanides are oxidized by alkaline chlorination (pH >10) but to oxidize any organic arsenic addition of permanganate or peroxides is required at a low pH. In such cases chromium reduction is not possible using wastewater treatment methods but stabilization is effective because it will act upon chromium and arsenic regardless of their oxidation state.

COMMENT NUMBER: 8-A-12
DOCKET NUMBER: LD 12-00130
COMMENTER: Wayne Disposal, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards

RESPONSE

The Agency acknowledges the commenter's remarks stating that the 0.094 mg/l proposed treatment standard for D007 nonwastewaters are unrealistically too low and are unachievable.

EPA decided that the proposed nonwastewater treatment standard based on K062 data (which is essentially wastewater treatment data) may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out the much D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 may not be routinely achievable for all forms of D007 nonwastewaters. Based on the data submitted during the comment period, the Agency calculated a treatment standard of 4.3 mg/l for D007 nonwastewaters.

Details on the assessment of the D007 treatment performance data submitted to the Agency during the comment period may be found in the Final Best Demonstrated Available Technology (BDAT) Background Document for Chromium Waste D007 and U032.

After review of all the treatment performance data and comment received for D007 wastes, the Agency believes that there are vast differences in the K062 (from which the proposed standard was transferred) waste and D007 waste.

COMMENT NUMBER: 8-A-12 (continued)
DOCKET NUMBER: LD 12-00130
COMMENTER: Wayne Disposal, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

Because of this diversity i.e., high total chromium content, high hexavalent chromium concentration, and the presence of complexing agents many commenters believed that the proposed D007 nonwastewater standard of 0.094 mg/l may not be routinely achievable. This position was supported by the vast majority of the commenters.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters and wastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Third Third Rule) can be treated to this level.

The commenter also expressed concern that an arsenic and chromium containing waste may be unique and the commenter implied that it may not be as treatable as other D007 wastes using the technology upon which EPA based its treatment standard development.

The commenter is reminded that treaters of D007 wastes may use whatever technology necessary to achieve the concentration-based standards. If the commenter believes that their waste still cannot meet the standards they may petition EPA for a treatment variance.

Comment Number: 8-A-13
Docket Number: LD12-00138
Commenter: Oxy Chem
Issue: 8-Chromium (D007)
Subissue: Treatment Standards
Comment:

The Agency's Proposed Treatment Standard for D007 Nonwastewaters is a TCLP Concentration of 0.094 mg/l. It Acknowledges That Leachate Data for Stabilized F006 Wastes Result in a Standard of 5.2 mg/l. However, It Fails To Note That It Has Promulgated a Leachate Standard of 1.7 mg/l for K048-K052 Nonwastewaters. These Two Sets of Data Demonstrate That The Proposed Standard of 0.094 mg/l Cannot Be Technically Supported for the Universe of D007 Nonwastewaters.

The Agency's proposed standard for D007 nonwastewaters is based on the K062 data base (54 Fed. Reg. 48437). EPA acknowledges that it has data for stabilization of F006 nonwastewaters that demonstrates that the proposed standard cannot be met. It states that it believes that this is because the F006 waste may have contained hexavalent chromium, which is more soluble than trivalent chromium.

The Agency has failed to note that the treatment standards for chemically-stabilized K048-K052 nonwastewaters are over 18 times higher than the proposed D007 standard. Thus, there are at least two wastes for which EPA has stabilization data that cannot achieve the proposed standard based on K062 nonwastewaters.

This result forcefully demonstrates the flaws in the Agency's technology analysis approach for characteristic, "U" and "P" wastes. It is technically unsupportable to establish a standard for a universe of wastes with undefined characteristics using a single waste, especially when the Agency's own BDAT analysis demonstrates at least two wastes with well-defined characteristics cannot be treated to the proposed standard.

EPA should set the treatment standard for D007 nonwastewaters at the 5.6 mg/l concentration established for F006 nonwastewaters. This is the only technically defensible approach to provide reasonable assurance that the standard can be met.

COMMENT NUMBER: 8-A-13
DOCKET NUMBER: LD 12-00138
COMMENTER: Oxy Chem
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standard
RESPONSE

The Agency acknowledges the commenter's remarks stating that the 0.094 ppm treatment standard for D007 nonwastewaters are not routinely achievable due to the vast differences in the D007 waste matrices. The commenter does not believe that the K062 data is representative of the universe of D007 nonwastewaters.

EPA decided that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out the much D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters.

Based on the data submitted during the comment period, the Agency calculated a treatment standard of 4.3 mg/l for D007 nonwastewaters. The bulk of these data did not meet EPA's for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularly untreated TCLP for corresponding treated TCLP concentrations; most of the commenters fail to provide untreated 2) no Quality Control/Quality Assurance (QA/QC) data and 3) lack of design and operations information of D007 wastes. Therefore, the Agency rejected most of these data for consideration of a standard. The data evaluated to determine 4.3 mg/l treatment level represent only a small fraction of the total data received on treatment of D007 wastes.

COMMENT NUMBER: 8-A-13 (continued)
DOCKET NUMBER: LD 12-00138
COMMENTER: Oxy Chem
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standard
RESPONSE

Details on assessment of these data is presented in the Final Best Demonstrated Available Background Document (BDAT) for Chromium Waste D007 and U032.

Although these data were not considered for calculating treatment standards, the data did suggest much variability in treatment for D007 nonwastewaters. This is suggestive of the difficulties in treating some D007 waste matrices. Many commenters expressed concerns that due to the fact that D007 waste matrices are so diverse (i.e., high concentrations of total chromium, higher percentage of hexavalent chromium, and the presence of complexing agents in some D007 waste streams), the diversity will prevent them from routinely achieving the proposed standard. Some commenters suggested that even the alternate 5.2 standard from stabilization of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-14
Docket Number: LD12-00143
Commenter: GENERAL MOTORS CORPORATION
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

Proposed Treatment Standards for Chromium

GM agrees with the Agency's proposal to regulate chromium in wastes as "total" chromium (page 48436), rather than distinguishing between its two valence states. However, we do not agree that merely because high levels of chromium in some wastes can be treated to less than the characteristic-level for D007 that the Land Disposal Restriction (LDR) treatment standard should be established at less than that level. As stated previously, we cannot agree with establishing a standard merely on the basis of it being technically achievable, without any regard to whether it is economically feasible or necessary for protection of public health and the environment.

We therefore recommend that the treatment standards for chromium for both D007 wastewaters and nonwastewaters be established at the existing characteristic level (5.0 mg/l) as measured in the leachate generated in the EP Toxicity test.

COMMENT NUMBER: 8-A-14
DOCKET NUMBER: LS12-00143
COMMENTER: General Motors Corporation
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standard
RESPONSE

The Agency thanks the commenter for their support of regulating total chromium and establishing the D007 standard at the characteristic level. For the final rule the Agency has, in fact, promulgated D007 treatment standards for total chromium at the characteristic level. However, the Agency wishes to point out that the Land Disposal Restrictions program does not focus upon the economic impact when promulgating Best Demonstrated Available Technology (BDAT) but rather the "Best" achievable levels as implied by the acronym BDAT.

Comment Number: 8-A-15
Docket Number: LD12-00146
Commenter: LEATHER INDUSTRIES RESEARCH LAB
Issue: 8-CHROMIUM (D007)
Subissue: TREATMENT STANDARDS
Comment:

In addition to the comments presented above concerning the Agency's proposal to base BDAT standards on total chromium, we do not believe the proposed treatment standard of 0.094 mg/l can be consistently met for the entire universe of potential D007 nonwastewater materials. While the standard may be suitable for relatively "clean" materials of alkaline pH, we do not feel it is suitable for other types of waste material, particularly those with lower pH. Tanning industry wastes, although excluded from RCRA regulation, provide a good example. These materials typically have a trivalent chromium content in the order of 25,000 ppm (dry weight basis) and many have a pH below five. The Leather Industries Research Laboratory has made an extensive study of chromium leachability from industry waste materials, and found TCLP values ranging from 0.38 - 246 mg/l.4) Based on these data, it seems unlikely that all D007 waste materials, although converted entirely to Cr(III), would be able to meet a TCLP standard of 5.2 mg/l, and certainly could not meet a standard of 0.094 mg/l (total chromium). Once again, however, we believe this standard should be based on Cr(VI), in which case the proposed level should be able to be readily met.

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4) Menden, E.E. and Rutland, F.H., Comparison of Chromium Leachability from Tannery Waste Using EP Toxicity and Toxicity Characteristic Leaching Procedure Methods, JALCA, Vol. 83 (1988), page 220 - enclosed as Exhibit D.

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COMPARISON OF CHROMIUM LEACHABILITY FROM TANNERY WASTE USING EP TOXICITY AND TOXICITY CHARACTERISTIC LEACHING PROCEDURE METHODS

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Abstract

A total of 82 samples typical of leather industry solid waste materials was evaluated for chromium leachability by EPA Extraction Procedure Toxicity (EPT) and Toxicity Characteristic Leaching Procedure (TCLP) methods. These samples consisted primarily of wet blue leather trimmings and shavings, dry leather trim scrap, buffing dust and sludge. For acidic materials ($pH < 5$) such as wet blue and dry leather wastes, TCLP extraction was 4-5 times more aggressive than EPT due to the complexing effect of acetate ion. The majority of such materials would exceed a regulatory threshold of 5.0 mg/l if based on total Cr rather than CrVI. For alkaline sludge wastes, the difference in EPT and TCLP extraction was quite small, if indeed significant, and a majority of samples was below 5.0 mg/l. Chromium leachability from dry leather waste was substantially lower than wet blue, despite higher solids content. Thus, leather drying appears to have a major beneficial effect. Efforts to analyze the effects of moisture level, chromium content and pH were inconclusive, and more work is planned to further clarify their role in chromium leachability.

Introduction

Leather tanning can be accomplished with a wide variety of vegetable, mineral, oil, resin, aldehyde and other organic syntan materials. However, the primary tanning agent used by the leather industry today is basic (trivalent) chromic sulfate [$Cr(OH)SO_4$], and this is unlikely to change in the foreseeable future. Although some firms purchase sodium dichromate (CrVI) as a starting material, this chromium is reduced to CrIII prior to use since CrVI does not have the ability to combine with hide protein and effect the tanning process(1). Typical full-chrome tanned leather will generally contain 2.5 - 5.5 percent chromium (expressed as Cr_2O_3 on a moisture free basis). Therefore, solid wastes from tanning and leather product industries (SIC 31) may also contain significant quantities of trivalent chromium. As a consequence, regulatory changes that potentially affect the status of chromium-containing wastes are of vital concern to these industries.

Evaluation of solid waste for the Characteristic of EP Toxicity under the Resource Conservation and Recovery Act (RCRA) is currently done by application of the EP Toxicity Test (EPT)(2). The regulatory threshold for chromium is 5.0 mg/l in the resulting leachate. Since it has been shown that CrIII has low environmental mobility and toxicity in comparison to CrVI(3), certain CrIII-containing wastes including tanning industry wastes and finished leather trim scrap have been specifically excluded from RCRA regulation(4). In addition it has been proposed to modify the Characteristic of EP Toxicity to apply only to CrVI(5). To date, the CrIII exclusion and proposed modification of the Characteristic of EP Toxicity have never been finalized by EPA. This fact, in conjunction with recently

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enacted hazardous waste land disposal restrictions(6), make chromium leachability a subject of continuing concern(7).

In 1986, EPA proposed a second generation leaching procedure, the Toxicity Characteristic Leaching Procedure or TCLP(8). This test was developed to provide better recovery of volatile organic materials, a simpler laboratory procedure and better reproducibility, and is supposed to give metal leachability results comparable to EPT. For waste materials with a pH of 5 or higher this may well be the case, but for more acidic wastes the methods are significantly different. The EPT procedure(2) calls for maintenance of the extraction fluid at pH 5.0±0.2 by the addition of 0.5 N acetic acid (up to a maximum of 4 ml of acid per gram of sample). With acidic samples of pH 5 and lower, no acid is added and extraction is carried out in water only. In the TCLP test(8), acidic samples are extracted with buffered acetate solution. Since organic ligands such as acetate have the ability to complex metals and increase their solubility(9), the TCLP test should extract significantly more chromium from acidic waste materials. Tanning industry wastes (other than wastewater treatment sludge) normally have a pH between 3 and 5, so adoption of the TCLP could have detrimental regulatory impact on these materials.

The objectives of this project were: 1) to compare EPT and TCLP leaching result on typical tanning industry and finished leather waste materials, 2) to characterize industry wastes in relation to the existing regulatory threshold, and 3) to determine if process modification and/or post-treatment technologies may offer practical means of reducing chromium leachability. Work on the first two of these objectives is reported in this paper. Additional research is planned in relation to the third objective, which will be reported at a later date.

Experimental

SAMPLES

A total of 82 samples was obtained from 18 cooperating tanning facilities, representing the full range of typical industry chromium-containing solid waste materials. Since workload and equipment considerations limited sample processing to approximately two per week, an attempt was made to schedule sample receipt to minimize storage time in the laboratory. Wet samples including sludges were stored in sealed containers under refrigeration (ca. 4°C) and were given priority in processing. Actual storage time varied from 1 to 47 days and averaged 14 days (8 days for sludge samples). Sample aging was not considered as a variable in this evaluation.

For ease of reporting, samples were grouped into three categories as shown in Table I:

TABLE I

Waste Sample Descriptions

Sample Type	No. of Samples
Wet Blue Leather Waste	
Wet Blue Trimmings	17
Wet Blue Shavings	4
Dry Shavings	2
Wet Blue Fleshings	1
Dry Leather Waste	
Dry leather trim scrap	24
Dry buffing dust	5
Wet buffing dust	2
Sludge	27

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These materials can be generally described as follows:

1. *Wet Blue Leather Waste*—Never dried, chrome-tanned, semi-processed leather trimmings and shavings (two samples of blue shavings had air-dried prior to receipt);
2. *Dry Leather Waste*—Crust or finished chrome-tanned leather trim scrap (also typical of trim scrap from leather product manufacturing or discarded leather articles), and buffing dust (both wet and dry depending on collection method);
3. *Sludge*—Solid waste materials from settling, screening/filtering, skimming, and/or precipitating tannery effluent streams.

Each of these groups was felt to be reasonably consistent based on general characteristics and process origin, however, significant variations were represented within each group.

EXPERIMENTAL

Samples were analyzed in duplicate for total moisture, total chromium and chromium leachability by EPT and TCLP procedures. Due to sample size limitations, TCLP extractions on 12 dry leather waste samples and EPT extractions on two dry leather waste and three sludge samples were not performed. Except for sludge samples, original sample pH was not determined. For acidic wastes ($pH < 5$) extracted in water only, the final EPT pH should be approximate sample pH. Wet blue and dry leather trim samples were reduced to appropriate particle size (< 9.5 mm) for chemical analysis and extraction using a power cutter (Landis Machine Co., St. Louis, MO) or by hand with a razor blade. Sludge samples were homogenized manually or in a Waring blender. Analytical methods utilized were as follows:

1. *Total Moisture Content* (oven method) - ASTM D 3790(10)
2. *Total Chromium Content* (results expressed as percent chromic oxide on a moisture free basis):
   a. *Leather and wet blue* - ASTM D 2807 (perchloric acid oxidation and titration with sodium thiosulfate)(11)
   b. *Sludge* - EPA Method 3050 (acid digestion(12) followed by flame atomic absorption spectrophotometry (FAAS) using a Varian AA-475 instrument)
3. *Chromium Leachability* (results expressed as mg/l Cr):
   a. *EPT*(2) - Extractions were carried out using 100 g samples in a 4-bottle, end-over-end extractor turning at 30 rpm (Associated Design and Manufacturing, Alexandria, VA). Most samples were extracted in 2*l* high density polyethylene bottles (Nalge). For ease of cleaning, "oily" samples (high fat and/or solvent content) were extracted in 2*l* borosilicate glass bottles with external PVC coating (Associated Design and Manufacturing). Filtration of extraction solutions (and, where necessary, phase separations of sludge samples) was carried out in a pressurized, internally Teflon-coated, stainless steel filtration device (Millipore Corp. cat. no. YT30142HW). For samples with initial $pH < 5$, there was one deviation from the standard method. Adjustment of pH was done by dropwise addition of glacial acetic acid (up to a maximum of 11.4 ml) rather than using 0.5 N HAc. Thus, the quantity of extraction fluid was held constant at ca. 1600 ml. Resulting extracts were diluted with 400 ml of water prior to filtration and analysis. EPT extracts were acidified with 70% HNO_3 to $pH < 2$ and stored at 4°C until Cr determinations by FAAS.
   b. *TCLP*(8) - Extractions and filtrations were carried out using 100 g samples of the same equipment utilized for EPT. TCLP extracts were acidified and stored as above prior to Cr determination by FAAS.

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All chemicals were ACS reagent grade (Fisher Scientific Co.). Reagent preparation and sample extractions were performed with distilled water. The following supplies were also used: 2/ sealed polyethylene bags for temporary sample storage; 50 ml capped polypropylene centrifuge tubes for exact storage (Corning); fiberglass filters - 14.2 cm dia., grade GF/F (Whatman Ltd.); HA-type filters - 0.45 mm pore dia. (Millipore Corp., cat. no. HAWP 14250).

Results and Discussion

Complete experimental data for all samples tested are given in Tables IV - VI (wet blue waste - Table IV; dry leather waste - Table V; sludge waste - Table VI. Data ranges, arithmetic means and standard deviations for each of the three primary sample groups are summarized in Table II. Similar data for five selected sub-groups are presented in Table III.

TABLE II

Summary of Sample Results

	As Received		Extraction Data (Cr - mg/l)		TCLP/EPT Ratio	Final Extract pH	
	Moisture (%)	Cr_2O_3 (% mfb)(a)	EPT	TCLP		EPT	TCLP
Wet Blue Leather Waste(b)							
Mean	57.7	3.79	43.4	139	4.33	3.52	4.71
Range	50.7-65.5	2.71-4.97	8.49-140	71.2-246	1.49-10.7	3.20-4.02	4.64-4.78
Std Dev	3.53	0.67	35.3	51.8	2.02	0.21	0.04
n	21	21	21	21	21	21	21
Dry Leather Waste(c)							
Mean	11.7	3.70	11.2	40.0	5.14	3.77	4.78
Range	8.20-15.2	1.47-5.62	2.20-48.6	3.71-148	1.29-11.2	3.25-4.75	4.66-4.88
Std Dev	1.97	1.02	10.2	31.7	2.44	0.42	0.07
n	29	29	17	27	15	17	27
Sludge Waste(d)							
Mean	66.1	3.26	3.47	3.61	3.39	5.27	5.39
Range	20.5-87.5	0.22-21.6	0.13-18.4	0.38-25.7	0.08-15.2	2.40-6.96	4.43-8.72
Std Dev	16.2	4.41	3.01	6.43	4.11	0.82	1.00
n	21	21	21	18	18	21	18

(a) Moisture free basis
(b) Dry blue shavings (n = 2) and wet fleshings (n = 1) omitted
(c) Wet buffing dust (n = 2) omitted
(d) Low chrome sludge (n = 3) and oily sludge (n = 3) omitted

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TABLE III

Analysis of Sample Sub-groups

Sample Description	As Received		Extraction Data (Cr - mg/l)		TCLP/EPT Ratio	Final Extract pH	
	Moisture (%)	Cr_2O_3 (% mfb)[a]	EPT	TCLP		EPT	TCLP
Wet Blue Trimmings							
C2	62.0	3.29	20.4	81.8	4.01	3.81	4.78
E1	59.8	2.76	27.8	195	7.01	3.31	4.73
L5	50.7	3.20	13.3	71.2	5.35	3.73	4.73
Mean	57.5	3.08	20.5	116	5.46	3.62	4.75
Wet Blue Shavings							
C3	55.2	3.36	30.7	152	4.95	3.52	4.71
E8	57.2	4.37	38.3	206	5.38	3.20	4.68
L4	52.8	3.49	8.49	91.2	10.7	4.02	4.77
Mean	55.1	3.87	25.8	130	7.01	3.38	4.72
Dry Shavings							
C4	17.2	3.79	33.7	153	4.54	3.30	4.58
Dry Leather Waste							
B4	8.52	2.92	4.34	33.7	7.76	4.73	4.88
F3	13.5	4.27	13.2	72.8	5.52	3.91	4.80
F4	15.2	5.16	48.6	148	3.05	3.68	4.69
G4	11.0	3.93	—	51.8	—	—	4.80
G5	11.6	4.14	12.6	45.5	3.63	3.79	4.80
G6	12.4	2.71	10.4	90.8	8.73	3.25	4.70
I3	13.9	4.25	12.2	50.6	4.15	3.61	4.71
J2	15.0	4.19	17.2	85.0	4.94	3.53	4.66
Mean	12.6	3.95	16.9	72.3	5.40	3.79	4.76
Dry Buffing Dust							
B5	9.78	3.38	—	33.9	—	—	4.85
F6	11.3	3.30	—	44.4	—	—	4.83
G7	8.81	3.51	—	10.8	—	—	4.78
I1	8.20	4.09	—	20.7	—	—	4.76
J1	8.33	1.98	—	18.9	—	—	4.68
Mean	9.28	3.65	—	25.7	—	—	4.78

(a) Moisture free basis

Wet Blue Leather Waste (n = 24) - With reference to Table IV and Table II, moisture levels for wet blue trimmings and shavings ranged 50.7—65.5% and averaged 57.7±3.5%—normal for mixed wrung and unwrung stock. Moisture levels for the two samples of dry blue shavings and one sample of wet fleshings were well outside of this range. In addition, sample F5 had abnormally high pH indicating the possibility it may have been lime stabilized. As a consequence, these three samples were omitted from Table II. Chromic oxide contents ranged from 2.71 - 4.97% and averaged 3.79±0.67%—also normal for

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TABLE IV

Wet Blue Leather Waste

Sample Description	As Received		Extraction Data (Cr - mg/l)		TCLP/EPT Ratio	Final Extract pH	
	Moisture (%)	Cr_2O_3 (% mfb)[a]	EPT	TCLP		EPT	TCLP
Wet Blue Trimmings							
A2	54.1	4.05	47.3	141	2.98	3.50	4.73
B2	57.0	4.69	32.7	170	5.20	3.76	4.78
C2	62.0	3.29	20.4	81.8	4.01	3.81	4.78
E1	59.8	2.76	27.8	195	7.01	3.31	4.73
F2	60.3	4.17	21.3	118	5.54	3.72	4.73
G2	59.0	3.82	140	219	1.56	3.24	4.71
G3	57.3	3.39	107	159	1.49	3.20	4.71
I8	53.0	4.87	39.7	95.2	2.40	3.70	4.73
I9	59.1	4.97	122	246	2.02	3.26	4.66
J3	59.8	4.05	29.5	104	3.53	3.44	4.73
K1	59.3	3.86	65.1	164	2.52	3.36	4.71
K2	53.0	3.47	40.8	126	3.09	3.36	4.74
L3	50.7	3.20	13.3	71.2	5.35	3.75	4.73
O1	61.4	3.25	19.8	91.2	4.61	3.51	4.65
O2	58.1	2.71	20.2	102	5.05	3.54	4.67
O3	65.5	3.68	20.0	82.5	4.12	3.60	4.64
O4	60.5	2.84	19.8	93.8	4.74	3.30	4.66
Wet Blue Shavings							
C3	55.2	3.36	30.7	152	4.95	3.52	4.71
E8	57.2	4.37	38.3	206	5.38	3.20	4.68
H2	56.3	4.73	46.2	216	4.68	3.30	4.68
L4	52.8	3.49	8.49	91.2	10.7	4.02	4.77
Dry Blue Shavings							
C4	17.2	3.79	33.7	153	4.54	3.30	4.58
F3	13.7	3.95	8.66	118	13.6	3.13	4.96
Wet Fleshings							
H1	73.9	2.13	24.2	65.6	2.71	3.73	4.77

(a) Moisture free basis

full-chrome tanned stock. Combining these data, a 100 g (as received) test sample of typical wet blue tannery waste would contain ca. 1.1 g of available chromium (as Cr).

Leachate results for all wet blue samples were well above a regulatory threshold of 5.0 mg/l based on total chromium. EPT* results ranged from 8.49 - 140 mg/l and averaged 43.4 ± 35.3 mg/l. As expected, TCLP* results were significantly higher, ranging 71.2 - 246 mg/l and averaging 139 ± 51.8 mg/l, despite the fact that EPT final pH averaged 1.2 units lower than TCLP. (All wetblue TCLP samples were run with extraction fluid No 1—buffered acetate solution). Based on average extraction data for the 21 samples, TCLP was higher than EPT by a factor of 3.20. However, the average value of TCLP/EPT ratios for individual samples was 4.33, and ranged 1.49 - 10.7.

*In referring to leachate results throughout the text, the terms EPT and TCLP are used to signify chromium leachate levels in mg/l Cr as determined by the respective methods.

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TABLE V

Dry Leather Waste

Sample Description	As Received		Extraction Data (Cr - mg/l)		TCLP/EPT Ratio	Final Extract pH	
	Moisture (%)	Cr_2O_3 (% mfb)^a	EPT	TCLP		EPT	TCLP
Dry Leather Waste							
B4	8.32	2.92	4.34	33.7	7.76	4.73	4.88
D2	13.4	4.79	2.20	9.48	4.30	3.37	4.87
D3	10.6	4.87	—	3.71	—	—	4.88
D4	11.0	3.06	3.59	20.2	5.63	3.74	4.85
E2	8.92	2.51	8.44	22.6	2.68	3.31	4.74
E6	11.7	5.62	—	44.2	—	—	4.70
E7	12.4	2.72	—	13.6	—	—	4.72
F3	13.5	4.27	13.2	72.8	5.52	3.91	4.80
F4	13.2	3.16	48.6	148	3.05	3.68	4.69
G4	11.0	3.93	—	51.8	—	—	4.80
G5	11.6	4.14	12.6	45.5	3.63	3.79	4.80
G6	12.4	2.71	10.4	90.8	8.73	3.25	4.70
H3	9.44	2.68	—	12.1	—	—	4.80
H4	13.4	3.37	11.2	40.2	3.59	3.95	4.81
H5	10.9	3.99	13.4	79.8	5.96	3.37	4.74
I3	13.9	4.25	12.2	50.6	4.15	3.61	4.71
J2	15.0	4.19	17.2	85.0	4.94	3.53	4.66
K4	12.2	4.00	3.42	38.2	11.2	4.67	4.84
L2	13.1	3.84	—	23.5	—	—	4.77
L3	12.6	3.19	—	11.1	—	—	4.74
N1	12.4	3.42	8.5	40.5	4.76	4.19	4.87
N2	11.6	1.47	10.0	12.0	1.20	3.91	4.87
P1	13.9	3.04	7.17	—	—	3.44	—
P2	13.9	3.04	4.25	—	—	3.42	—
Dry Buffing Dust							
B3	9.78	3.38	—	33.9	—	—	4.85
F6	11.3	5.30	—	44.4	—	—	4.83
G7	8.81	3.31	—	10.8	—	—	4.78
I1	8.20	4.09	—	20.7	—	—	4.76
J1	8.33	1.98	—	18.9	—	—	4.68
Wet Buffing Dust							
E3	71.6	2.32	0.93	1.53	1.65	4.88	4.84
K3	77.1	2.97	0.59	2.02	3.42	4.34	4.85

(a) Moisture free basis

With reference to Table III, an attempt is made to analyze the effects of particle size and moisture level on resulting extraction data using samples from the same sources. Wet blue shavings (fine particles) when compared to blue trimmings (coarse particles < 9.5 mm) had higher Cr_2O_3 and higher extraction results in exactly the same proportion. Since earlier work comparing ground-up and cut-up leather revealed no significant difference in chromium extractability, we believe the higher leachate levels are more likely a reflection of higher chromium content rather than finer particle size, but more work would have to be done to confirm this conclusion. Only one tannery submitted samples of both wet (C3)

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TABLE VI

Appendix C - Sludge Waste

Sample Description	As Received		Extraction Data (Cr - mg/l)		TCLP/EPT Ratio	Final Extract pH	
	Moisture (%)	Cr_2O_3 (% mfb)[a]	EPT	TCLP		EPT	TCLP
Sludge Waste							
A1	59.8	0.62	18.4	12.8 -	0.70	2.40	4.77
B1	20.5	0.22	0.16	0.38	2.34	5.82	5.69
D1	71.0	2.93	2.97	5.39	1.81	5.06	5.10
F1	73.9	0.69	0.96	1.51	1.57	5.78	5.88
G1	74.8	2.31	1.32	1.63	1.24	5.05	5.02
H7	72.3	2.14	11.1	9.34	0.84	5.16	5.14
H8	64.1	6.47	5.76	13.4	2.33	5.20	5.05
I5	68.3	5.17	0.13	1.97	15.2	5.19	4.92
I6	87.5	4.50	0.55	1.94 -	3.53	4.96	5.18
I7	77.0	1.62	10.6	10.2	0.96	4.92	4.88
J4	73.0	3.52	1.05	0.93	0.89	6.96	6.91
K3	74.3	0.41	0.26	0.68	2.62	4.93	4.43
L1	41.3	3.33	12.2	1.01	0.08	6.23	8.72
M1	72.5	0.61	0.54	0.70	1.30	5.73	5.64
M2	76.1	3.37	0.68	6.72	9.88	5.04	4.32
M3	68.8	21.6	2.49	25.7	10.3	5.11	4.60
M4	81.3	2.08	0.65	4.92	7.57	5.17	4.71
N3	27.7	0.47	1.31	1.83	1.40	5.87	5.90
Q1	70.3	2.32	0.24	—	—	5.27	—
Q2	68.8	2.57	0.30	—	—	5.00	—
R1	64.0	1.40	1.21	—	—	5.90	—
Low Chrome Sludge							
C1	66.3	0.08	0.34	0.41	1.21	5.15	4.92
H6	78.3	0.02	<0.10	<0.10	—	4.94	5.20
I4	8.65	0.05	0.14	0.14	1.00	5.22	5.04
Oily Sludge							
E4	27.8	1.19	210	204	0.97	3.85	4.98
E5	39.7	1.33	274	286	1.04	3.86	4.82
I2	73.9	5.90	448	504	1.13	3.78	4.76

(a) Moisture free basis
(b) Extraction fluid No. 1 (all other samples run with extraction fluid No. 2)

and dry (C4) shavings. Despite the fact the amount of available chromium in these samples differs by a factor of 2.5, leachate chromium levels are virtually identical.

Dry Leather Waste (n = 31) - As shown in Table V and Table II, moisture levels for dry leather trim scrap and buffing dust fell within a normal range of 8.20 - 15.2% and averaged 11.7 ± 1.97%. Two samples of wet buffing dust, which had very high moisture levels and appear to have lost most of their extractable chromium (probably due to leaching in the wet dust collection systems), were omitted from Table II. Average chromic oxide level (3.70 ± 1.02%) was in good agreement with previous wet blue samples.

EPT results ranged 2.20 - 48.6 mg/l and averaged 11.2 ± 10.2 mg/l. Of 17 samples tested, only five (29%) would pass a regulatory threshold of 5.0 mg/l based on total

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chromium. TCLP results again were significantly higher, ranging 5.71 - 148 mg/l (none below 5.0 mg/l) and averaging 40.0±31.7 mg/l. Compared to wet blue leather waste, leachate Cr levels for dry leather waste are only one-fourth as high despite a two-fold increase in solids content. It has been suggested this reduction might be due to removal of free Cr during retanning/coloring/fatliquoring and/or to a beneficial effect of leather drying causing increased chromium fixation. In view of the similarity in chromium levels, the latter explanation appears more likely. This same effect has been noted after oven drying of wet blue shaving, but more work is also needed in this area. TCLP/EPT ratios averaged 5.14 (range 1.20 - 11.2), and EPT final pH averaged 1.0 unit lower than TCLP. (All TCLP samples were run with extraction fluid No. 1.) These data are quite similar to corresponding results for wet blue leather.

In Table III, there appears to be a significant and unexpected difference in the TCLP results for dry leather trim scrap (avg. = 72.3±34.2 mg/l) and dry buffing dust from the same sources (avg. = 25.7±11.9 mg/l). We have no explanation for this phenomenon without additional data. The observed reduction may be further evidence of thermal fixation resulting from frictional heat generated in buffing.

Sludge Waste (n = 27) - Data for sludge samples are given in Table VI and summarized in Table II. Two groups of samples were omitted from Table II: low chrome sludges (n = 3) with Cr_2O_3 content below 0.10% and negligible leachability; and, "oily" sludges which appeared to contain little or no bound chromium (EPT ≐ TCLP ≐ total chromium content). The remaining 21 samples represented by far the most varied group, generally considered by the industry to present the greatest potential regulatory concern. Sample moistures ranged from 20.5 - 87.5% and averaged 66.1±16.2%. Chromic oxide content ranged 0.22 - 21.6% with an average of 3.26±4.41%, only 13% below leather and wet blue wastes. Leachate results, however, were significantly lower due to the higher waste pH. EPT ranged 0.13 - 18.4 mg/l with an average of 3.47±5.01 mg/l. TCLP* ranged 0.38-25.7 mg/l and averaged 5.61±6.43 mg/l. At a regulatory threshold of 5.0 mg/l (total chromium), 76% of EPT samples 61% of TCLP samples would pass. Although TCLP/EPT ratios average 3.59, not substantially below leather and wet blue wastes, it is significant that the average difference in leachate results between EPT and TCLP was only 2.1 mg/l. Over half the samples had a TCLP/EPT ratio less than 2.0. Perhaps the most important parameter was final extraction pH. EPT and TCLP pH levels were almost identical and significantly higher than for leather and wet blue wastes.

General - An effort was made to determine if significant correlation(s) exist between the experimental parameters taken in various combinations. Selected variable pairs were subjected to linear regression analysis to determine their degree of interdependence(13, 14). The results are given in Table VII in terms of the following calculated values:

r - correlation coefficient (degree of interdependence of variable pair);

r^2- coefficient of determination (fraction of sample population's total variation explainable by the regression.

% certainty level - significance of r (percent not due to chance).

In order to improve the degree of correlation, a number of "outliers" were removed in accordance with one or both of the following criteria:

- the value of the (y) coordinate fell outside the range described by the mean of residual values ±2 standard deviations;

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*All samples were run with Extraction Fluid No. 2 (0.1N acetic acid) except A1 and I6, as noted in Appendix C.

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TABLE VII
Linear Regression of Selected Variable Pairs from Test Parameters of Leather (L), Sludge (S), and Wetblue (W) Wastes

Variable[a] (x)	Variable[a] (y)	Waste Type	r	r^2	% Certainty Level	n[b]	r[c]
pH EPT	pH TCLP	L	0.865	0.748	99.0	10	0.598
		S	0.933	0.870	99.9	16	0.933
		W	0.938	0.880	99.9	19	0.840
pH EPT	EPT	L	−0.509	0.259	90.0	12	−0.237
		S	−0.173	0.030	61.0	21	−0.173
		W	−0.703	0.494	99.9	19	−0.564
pH EPT	EPT/%Cr	L	−0.616	0.380	96.0	13	−0.421
		S	−0.182	0.033	63.0	21	−0.182
		W	−0.548	0.300	97.0	20	−0.548
pH EPT	TCLP	L	−0.622	0.386	94.0	10	−0.215
		S	−0.483	0.234	90.0	13	−0.305
		W	−0.757	0.573	99.9	19	−0.306
pH EPT	TCLP-EPT	L	−0.706	0.499	95.0	9	−0.171
		S	−0.433	0.189	83.0	12	−0.200
		W	−0.584	0.342	97.0	16	−0.131
pH EPT	(TCLP-EPT)/ EPT	L	0.803	0.644	99.0	11	0.533
		S	−0.429	0.184	82.0	12	−0.233
		W	0.788	0.621	99.9	20	0.788
pH EPT/ pH TCLP	EPT/TCLP	L	−0.692	0.479	97.0	11	−0.490
		S	−0.722	0.522	99.0	13	−0.564
		W	−0.700	0.490	99.0	18	−0.559
pH EPT/ pH TCLP	(TCLP-EPT)/ EPT	L	0.805	0.648	99.0	11	5.67
		S	0.733	0.537	99.0	14	0.600
		W	0.852	0.726	99.9	19	0.788
pH EPT/ pH TCLP	(TCLP-EPT)/ TCLP	L	0.692	0.479	97.0	11	0.490
		S	0.722	0.522	99.0	13	0.564
		W	0.559	0.312	98.0	20	0.559
pH TCLP	EPT	L	−0.839	0.704	99.0	11	−0.792
		S	−0.114	0.013	33.0	16	−0.144
		W	−0.650	0.422	99.0	14	−0.338
pH TCLP	TCLP	L	−0.655	0.429	99.0	10	−0.376
		S	−0.514	0.264	95.0	14	−0.300
		W	−0.848	0.719	99.9	17	−0.440
pH TCLP	TCLP-EPT	L	−0.798	0.638	99.0	11	−0.671
		S	−0.552	0.305	95.0	12	−0.362
		W	−0.498	0.248	95.0	17	−0.219
pH TCLP	(TCLP-EPT)/ %Cr	L	−0.698	0.487	97.0	11	−0.624
		S	−0.632	0.400	97.0	13	−0.417
		W	−0.551	0.304	96.0	16	−0.142
EPT	TCLP	L	0.856	0.732	99.9	11	0.780
		S	0.792	0.627	99.9	13	0.474
		W	0.665	0.442	99.0	20	0.665
EPT/TCLP	(TCLP-EPT)/ EPT	L	−0.909	0.826	99.9	12	−0.909
		S	−0.786	0.618	99.9	16	−0.786
		W	−0.784	0.614	99.9	20	−0.784
EPT/TCLP	(TCLP-EPT)/ TCLP	L	−1.000	1.000	99.9	12	−1.000
		S	−1.000	1.000	99.9	16	−1.000
		W	−1.000	1.000	99.9	20	−1.000
TCLP	(TCLP-EPT)	L	0.992	0.983	99.9	12	0.992
		S	0.981	0.962	99.9	14	0.850
		W	0.952	0.907	99.9	17	0.718
%Cr	EPT	L	0.628	0.395	96.0	12	0.290
		S	0.690	0.476	99.0	18	0.106
		W	0.303	0.092	70.0	14	0.072
%Cr	TCLP	L	0.500	0.250	96.0	21	0.156
		S	0.910	0.828	99.9	13	0.867
		W	0.402	0.162	90.0	18	0.178
%Cr	TCLP-EPT	L	0.426	0.182	78.0	10	0.086
		S	0.943	0.889	99.9	16	0.943
		W	0.638	0.407	99.0	16	0.304
%Cr	(TCLP-EPT)/ %Cr	L	−0.710	0.504	97.0	10	−0.354
		S	0.067	0.004	33.0	16	0.067
		W	−0.514	0.264	95.0	16	−0.423

(a) EPT and TCLP are Cr concentrations in mg/l, total %Cr is on as-received basis (undried).
(b) n (after removal of outliers) on which r, r^2, and % certainty level are based.
(c) r before removal of outliers.

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- recalculation of r without the suspected x-y coordinate pair resulted in significantly improved values of r^2 and % certainty level.

Since the results of this analysis were by and large inconclusive, no further discussion of these data is presented at this time, pending further experimental work and analysis.

Conclusions

For acidic materials (pH < 5) such as wet blue and dry leather wastes, the TCLP extraction method is significantly more aggressive than EPT by a factor of 4-5 on average and as much as an order of magnitude on certain waste samples. For alkaline sludge wastes, where extraction conditions are more comparable, the difference in EPT and TCLP extraction results is quite small, and may not be significant. If hazardous waste regulation were based on chromium leachability using the TCLP test at a regulatory threshold of 5.0 mg/l total chromium (rather than CrVI), all tested industry wet blue and dry leather waste materials would fail. (A majority would also fail the EPT test.) Sludge wastes, on the other hand, present less of a regulatory concern and the majority pass either test.

Processing of wet blue through retanning/coloring/fatliquoring and drying reduces chromium leachability by a factor of approximately eight on a constant weight basis. Some evidence would suggest this reduction is primarily the result of drying, particularly at elevated temperature. Insufficient processing data were obtained from contributing tanneries to attempt any correlation of experimental results with tanning conditions. Finally, efforts to correlate chromium leachability with sample pH, chromium content and moisture level were inconclusive, and will require additional experimental work which is currently planned.

Acknowledgments

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COMMENT NUMBER: 8-A-15
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COMMENTER: Leather Industries Research Lab
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SUBISSUE: Treatment Standards
RESPONSE

The Agency thanks the commenter for submitting comments and laboratory research data characterizing the leachability of chromium from waste from the leather tannery industry. These data show that the untreated chromium wastes from this industry leached chromium ranging from 0.38-246 mg/l TCLP, indicating that the D007 waste are diverse. The commenter did not provide any treatment data for these wastes so the Agency could not determine a treatable level based on this characterization data. The Agency acknowledges the commenter's remarks stating that the 0.094 mg/l treatment standard for D007 nonwastewaters can not be consistently met for all D007 nonwastewaters particularly those with low pH.

In today's rulemaking EPA has decided that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out that D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted during the comment period for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters.

Based on the data submitted, the Agency calculated a treatment standard of 4.3 mg/l for D007 nonwastewaters. The bulk of these data did not meet EPA's criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularly untreated TCLP for corresponding treated TCLP concentrations; most of the commenters fail to provide untreated 2) no Quality Control/Quality Assurance (QA/QC) data

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and 3) lack of design and operations information of D007 wastes. Therefore, the Agency rejected much of these data for consideration of a standard. The data evaluated to determine the 4.3 mg/l treatment level represent only a small fraction of the total data received on treatment of D007 wastes. Details on assessment of these data is presented inthe Final Best Demonstrated Available Background Document (BDAT) for Chromium Waste D007 and U032.

Although most data were not considered for calculating a treatment standard, these data did suggest much variability in treatment for D007 nonwastewaters. Many commenters expressed concerns that due to the fact that D007 waste matrices are so diverse (i.e., high total chromium content, higher hexavalent chromium concentration, the presence of complexing agents and low pH as suggested by the commenter, in some D007 waste streams), the diversity will prevent them from routinely achieving the proposed standard. Some commenters suggested that even the alternate 5.2 standard from treatment of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of the wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule), can be treated to this level.

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d. Chromium Nonwastewater/D007 (54 Fed. Reg. at 48,437)

EPA has proposed to set the treatment standard for chromium containing nonwastewater (D007) by transferring the treatment standard of 0.094 mg/l chromium by TCLP from K062 wastes. Applying this treatment standard to the general category of D007 wastes is insupportable. The preamble discussion itself demonstrates that this standard is unrealistic. There, EPA acknowledges that F006 wastes, which are chromium-bearing, can be treated only to 5.2 mg/l chromium, nearly two orders of magnitude higher than the proposed treatment standard for D007 nonwastewaters. In light of the inability of this and other chromium wastes to meet the proposed treatment standard, the Agency cannot claim that the proposed standard is "demonstrated."

Moreover, the Agency has chosen a particularly inappropriate waste from which to transfer treatment standards for chromium wastes. The conditions under which K062, wastewater treatment sludge from pickle liquor, is generated makes it a particularly easy waste to treat for chromium. The strong reducing conditions present in pickle liquor guarantee that all of the chromium present will be in the reduced trivalent state. As a result when lime is added to the liquor to form the wastewater treatment sludge, chromium (III) hydroxide is formed, which is substantially less soluble than chromium (VI) hydroxide.

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Therefore, the chromium does not leach out of the residue and a very low treatment standard is possible. In stark contrast, wastes containing hexavalent chromium will form the more soluble chromium (VI) compounds and cannot be treated to the same level as a waste containing solely trivalent chromium. Since the universe of D007 wastes includes wastes containing both trivalent and hexavalent chromium, setting a treatment standard for these wastes based on K062, which contains only trivalent chromium, is inappropriate. Instead, the treatment standard should be based on a waste containing hexavalent chromium.

To determine if the proposed treatment standard could be met with actual wastes typical of those received by a commercial waste treatment facility, CWM's Model City laboratory conducted stabilization studies on several waste samples which it had on hand. Unfortunately, most of the samples of D007 wastes immediately available had very low levels of chromium, but due to the short comment period they were all that was available. The results are presented in the following table Attachment G.

Attachment G lists the wastes analyzed and shows the amount of leachable chromium (as measured by the TCLP) for the wastes as received; and for the wastes as stabilized with a 1:0.25 ratio of waste to portland cement; the best result achieved in the laboratory; and the formula used to achieve that

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result. Several points apparent from Attachment G deserve notice. First, D007 wastes come in a great variety of physical and chemical forms and, therefore, transfer of treatment standards from relatively homogenous listed wastes should be done with great care, if at all. Second, only one of the nine wastes on which CWM attempted stabilization could meet the proposed treatment standard when stabilized with portland cement alone even though most of the samples originally contained levels of extractable chromium an order of magnitude lower than the characteristic level. Third, to achieve substantial reductions in extractable chromium from the remaining eight wastes required treatment with ferrous sulfate. This demonstrates that all of these samples contained substantial levels of hexavalent chromium. Therefore, Attachment G demonstrates that transfer of a chromium treatment standard from a waste (K062), that contains only trivalent chromium is not defensible or appropriate.

WMI agrees that the presence of hexavalent chromium is not uncommon to F006 wastes; however, we disagree that this reason alone justifies the transfer of a lower number.

CWM's research and development department also conducted a treatability study on chromium containing wastes, which demonstrated that in most cases the proposed treatment level of 0.094 mg/l could not be met. The results of this study

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is shown graphically in Attachment H. This graph is designed in the same manner as the arsenic graph in Attachment E. We believe this data supports a BDAT level of 5.2 mg/l for chromium.

In sum, more than 70% of the data points are above the proposed level for all wastes tested, and all of the non-listed (characteristic) waste results, are above the Agency's proposed BDAT level of 0.094 mg/l. If the chromium treatment standard were proposed at the existing F006/K061 BDAT level, all examples except one would have passed. The non-listed wastes consisted of incinerator residues, evaporator still bottoms, non-F006 metal finishing waste, paint booth waste, lead smelter residues, jet fuel treating clay and contaminated soils.

While CWM's treatability study did not specifically attempt to reach the 0.094 mg/l leaching level for chromium, it was optimized for metals in general and to meet specific metal levels, (e.g., 0.051 mg/l for lead and 0.315 for chromium at delisting levels.) If the formulations are changed in an attempt to meet proposed chromium level, problems are anticipated to result for the other metals contained in these wastes.

Therefore, WMI recommends a BDAT level for D007 chromium-containing nonwastewaters of 5.2 mg/l. This level is consistent with K061 and F006 nonwastewaters and is demonstrated on a broad universe of wastes.

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STABILIZATION OF D007 WASTES

Chromium by TCLP (mg/l)

Sample #	Description	Sample as Received	Stabilized With Cement	Best Result	Reagents
4705	Heat treating salt bath, 90% polymer	18.2	N/A[1]	N/A	N/A
4988	Kolene sludge w/35% NaCO3, 5% NaOH	17.45	N/A[1]	N/A	N/A
5096	Dust from glass furnace	35.9	0.08		
4527	Soil	0.065[2]	0.55	<0.05	1/0.2 cem 1/0.05 FS
4755	WWT sludge	1.85	0.11	0.05	1/0.2 cem 1/0.05 FS
3944	Baghouse dust/kiln dust (stab.)	0.40	0.18	0.065[3]	1/0.2 cem 1/0.05 FS
4917	Chrome (III) oxide presscake	0.43	0.22	0.085	1/0.2 cem 1/0.05 FS
3945	Solid paint sludge	0.15	0.2[4]	N/A	N/A
5072	Baghouse dust	0.98	0.12	0.05	1/0.2 cem 1/0.05 FS
4703	spent nitrate salt bath	11.8	6.35	0.06	1/0.2 cem 1/0.2 FS
151750	Chromic acid sludge	2515	2455	98[5]	1/0.2 cem 1/0.8 FS 1/0.6 LM

FS - Ferrous Sulfate LM - Lime CEM - Portland Cement

NOTES

1. These two samples could not be stabilized because the laboratory could not break up the pieces or grind them up sufficiently to render them suitable for stabilization. Sample 4088 is a Kolene salt which is poured into drums in the molten state and allowed to cool and harden. A hammer was not sufficient for particle size reduction. Sample 4705 is a heat treating salt bath which contains up to 90% polymer. The sample is plastic chunks and no particle size reduction could be performed.

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2. Although these particular samples do not test hazardous for chromium, they are treated by the generators as D007 wastes. Samples are sent to CWM annually for certification and may, as in this case, actually test non-hazardous. However, these wastes are highly variable and may, on occasion, test as hazardous. Therefore, to be cautious, generators treat them as D007 wastes. However, if the cost of treating them as such increases substantially, generators may decide to determine which batches actually are hazardous and send non-hazardous ones to Subtitle D facilities.

3. This sample was treatable to meet the proposed standard for chromium. If the level of chromium had been somewhat higher, it probably could not have been treated to meet the standard. This waste contains barium, cadmium, and lead in addition to chromium. As ferrous sulfate is added to the waste to treat the chromium, the pH is lowered, causing cadmium to leach out. If the pH is then raised with lime, the lead will leach out. The proposed treatment standard completely fails to consider the problems presented by wastes that contain multiple metals.

4. Note that the use of portland cement actually increased the level of extractable chromium in the waste. The TCLP analysis of the portland cement powder used showed 0.47 mg/l chromium and 0.39 mg/l lead.

5. Note that this waste could not be treated to meet the proposed standard even though the waste volume was more than doubled by the addition of stabilizing reagents.

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EPA thanks the commenters for their laboratory stabilization data. The commenter concluded that the proposed 0.094 mg/l treatment standard for D007 nonwastewaters is not demonstrated for D007 nonwastewaters and is not routinely achievable for all D007 waste matrices. The commenter believed that this was because of the vast differences in the waste matrices versus the K062 waste from which the proposed standards were based. Therefore, the commenter recommended that the Agency set the D007 nonwastewater standard at 5.2 mg/l.

These data consisted of 16 data points for stabilization of D007 nonwastewaters. These data did not contain Quality Assurance/Quality Control (QA/QC) data and there were questions as to whether these data were aggregate data points, and it was unclear as to the differences between the results given (two different sets of results were given). However, these data did indicate wide variability in the treatment of the various D007 nonwastewater streams i.e., <.05 to 2455 mg/l TCLP leachate. The Agency notes that the chromic acid sludge waste was only treated to 98 mg/l. Although these data are not sufficient in BDAT data quality and are highly variable to determine treatment standards, if they were used to develop a treatment standard, these data would result in a treatment standard of 900 ppm. Further, these data are suggestive of the difficulties in treating some D007 waste streams.

EPA also notes that another commenter from the waste treatment industry indicated that only levels slightly above the characteristic level would be typically achievable. The commenter also stressed in other portions of its comment (pp. 79-81) the difficulties of achieving

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treatment standards for multiple metals and how treatment standards should be revised to reflect these difficulties.

The Agency determined that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams, such as the organo metallic wastes. Many comments were received pointing out that D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters.

Based on the data submitted during the comment period, the Agency was able to calculate a treatment standard of 4.3 mg/l for D007 nonwastewaters. The bulk of these data submitted during the comment period did not meet EPA's criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularly untreated TCLP for corresponding treated TCLP concentrations; most of the commenters fail to provide untreated 2) no Quality Control/Quality Assurance (QA/QC) data and 3) lack of design and operations information of D007 wastes. Therefore, the Agency rejected many of these data for consideration of a standard. The commenter's stabilization data was not considered for development of a treatment standard because no QA/QC information was provided for these data. The data evaluated to determine 4.3 mg/l treatment level represent only a small fraction of the total

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data received on treatment of D007 wastes. Details on assessment of these data are presented in the Final Best Demonstrated Available Background Document (BDAT) for Chromium D007 and U032.

Although these data were not considered for calculating a treatment standard they did suggest much variability in treatment for D007 nonwastewaters (i.e, <.05 to 2455 mg/l TCLP leachate). Many commenters expressed concerns that due to the fact that D007 waste matrices are so diverse (i.e., high total chromium concentrations, higher percentages of hexavalent chromium and complexing agents in some D007 waste streams), the diversity will prevent them from routinely achieving the proposed standard of 0.94 mg/l for D007 nonwastewaters. Some commenters suggested that even the alternate 5.2 standard from the stabilization of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-17
Docket Number: LD12-00169
Commenter: Air Products and Chemicals, Inc.
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

The use of K062 performance data to derive the BDAT standard for D007 nonwastewaters (and certain other chromium-containing wastes) is inappropriate. To compare "apples to apples", performance data from the F006 Nonwastewater subcategory should have been used.

EPA has inappropriately transferred K062 chromium performance data to D007 Nonwastewaters. K062 treatment technology is based primarily on the precipitation of dissolved metals from an acidic liquid waste stream. While some D007 nonwastewaters may fit into this type of waste matrix, there are many D007 wastes which have a matrix which more closely matches K061 Nonwastewasters (a solid which passes the Paint Filter test). The BDAT chromium standard for K061 was derived F006 stabilization data.

The K062 waste stream typically consists of an inorganic acid (e.g. sulfuric or hydrochloric) and dissolved metals (e.g. iron, chromium, nickel). The chromium in K062 is predominantly trivalent chromium because the presence of iron in an liquid acidic matrix reduces any hexavalent chromium to the trivalent state. (In fact, K062 is widely used to treat other hexavalent chromium waste streams.) BDAT treatment for K062 involves precipitation of metals as a metal hydroxide/sulfide. Very little if any reduction of hexavalent chromium occurs using this treatment because the majority of the chromium is already present as the trivalent form before treatment occurs.

Comment Number: 8-A-17 (con't)
Docket Number: LD12-00169
Commenter: Air Products and Chemicals, Inc.
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

K062 treatment technology would not be effective in treating many types of D007 wastes that are in solid form, such as a sandblasting waste which may exhibit a D007 characteristic because of lead chromate paint residuals. Because of the waste matrix (a solid with neutral pH), adding lime or sulfide does would not result in the formation of the same type of metal hydroxide/sulfide precipitates that occur from treating K062.

To undergo K062-type treatment, the sandblasting waste would have to be slurried and acidified prior to lime/sulfide precipitation. However, we question the effectiveness of this treatment on hexavalent chromium and the resultant wet sludge will be of greater volume than the initial non-liquid waste stream. Additionally, we question whether there is sufficient TSDF capacity to slurry all of the D007 wastes which may be solid or semi-solid. We do not believe that K062 technology is "demonstrated" or "available" for all D007 nonwastewaters.

In summary, the BDAT chromium limit for D007 Nonwastewater should be 5.2 mg/l based on stabilization data for F006, not 0.094 mg/l based on precipitation data for K062. This would be consistent with the application of F006 chromium data to the K061 category. Several other BDAT standards based on the K062 chromium standard should also be reevaluated in light of the above discussion.

COMMENT NUMBER: 8-A-17
DOCKET NUMBER: LD 12-00169
COMMENTER: Air Products and Chemicals, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The commenter believes that the Agency should have used F006 treatment data as the basis for the proposed standard as opposed to the K062 data.

EPA has determined that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. The Agency received many comments pointing out the many differences for some D007 waste streams from K062 waste. Accordingly, EPA reviewed all the comments and performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters.

Based on the data submitted during the comment period, the Agency was able to calculate a treatment standard of 4.3 mg/l for D007 nonwastewaters. The Agency contemplated promulgating the 5.2 mg/l F006 standard, as it is even closer to the 5.0 mg/l characteristic level than the 4.3 standard calculated from data submitted by the commenters during the comment period.

The bulk of the data submitted during the comment period did not meet EPA's criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularly untreated TCLP for corresponding treated TCLP concentrations; most of the commenters failed to provide the untreated TCLP concentrations, 2) no Quality Assurance/Quality Control

COMMENT NUMBER: 8-A-17 (continued)
DOCKET NUMBER: LD 12-00169
COMMENTER: Air Products and Chemicals, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

(QA/QC) data and, 3) lack of design and operations information for the D007 wastes. Therefore, the Agency rejected much of the data for consideration of a standard. The data evaluated to determine the 4.3 mg/l treatment level represents only a small fraction of the total data received during the comment period on the treatment of D007 wastes. Details on assessment of these data are presented in the Final Best Demonstrated Available Background Document (BDAT) for Chromium Wastes D007 and U032.

Although most of the data were not considered for calculating a treatment standard, these data did suggest much variability in treatment for D007 nonwastewaters. Many commenters expressed concerns that due the fact that D007 waste matrices are so diverse (i.e., high total chromium concentrations, greater percentages of hexavalent chromium and the presence of complexing agents), the diversity will prevent them from routinely achieving the proposed standard. Some commenters suggested that even the alternate 5.2 standard from stabilization treatment of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with

COMMENT NUMBER: 8-A-17 (continued)
DOCKET NUMBER: LD 12-00169
COMMENTER: Air Products and Chemicals, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule) can be treated to this level.

The commenter expressed concerns that D007 sandblasting wastes would have to be slurried and acidified prior to precipitation, and therefore the commenter questioned whether this would work on their waste. The commenter is reminded that BDAT is the technology from which the treatment standards are based and they may use whatever technology necessary to achieve the concentration-based treatment standard. In light of the fact that the Agency is now promulgating the characteristic level for chromium, i.e. 5.0 mg/l the Agency has taken in to account the diversity of wastes that may qualify as D007. However, should the commenter believe that their waste still cannot meet the standard, they should submit treatment performance data to the Agency for consideration of a treatment variance.

Comment Number: 8-A-18
Docket Number: LD12-00172
Commenter: Hazardous Waste Treatment Council
Issue: 8- Chromium (D007)
Subissue: Treatment Standard
Comment:

G. D007

The BDAT standard proposed by EPA is inappropriate for D007 waste. The reasons are primarily the vast differences in the matrices for these wastes, versus the K062 waste that the proposed standard is technology transferred from. (See Docket Document No. LDR7-S0348).

First, K062 wastes are aqueous liquids comprised of 93% water, and are comprised of just a few simple major components, usually either sulfuric or hydrochloric acid, and iron salts. The solids content of these wastes rarely exceeds 0.5%. The waste rarely exceeds levels of 3000 PPM chromium. For example, the non-wastewater K062 streams evaluated by EPA averaged 1500 PPM chromium to begin with, and ranged in concentration from 396 to 7000 PPM. (See Tables 2.7 and 2.8 in Docket Document LDR7-S0348).

COMMENT NUMBER: 8-A-17 (continued)
DOCKET NUMBER: LD 12-00169
COMMENTER: Air Products and Chemicals, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule) can be treated to this level.

The commenter expressed concerns that D007 sandblasting wastes would have to be slurried and acidified prior to precipitation, and therefore the commenter questioned whether this would work on their waste. The commenter is reminded that BDAT is the technology from which the treatment standards are based and they may use whatever technology necessary to achieve the concentration-based treatment standard. In light of the fact that the Agency is now promulgating the characteristic level for chromium, i.e. 5.0 mg/l the Agency has taken in to account the diversity of wastes that may qualify as D007. However, should the commenter believe that their waste still cannot meet the standard, they should submit treatment performance data to the Agency for consideration of a treatment variance.

Comment Number: 8-A-18 (con't)
Docket Number: LD12-00172
Commenter: Hazardous Waste Treatment Council
Issue: 8- Chromium (D007)
Subissue: Treatment Standard
Comment:

In contrast, the D007 waste streams represent a wide variety of physical forms and matrices. Many D007 waste streams are solids and sludges, not liquids like K062, and are comprised of less than 50% water. The solids content often exceeds 30%. In addition, D007 waste tend to be much higher in chromium concentration. Chromium levels of 20,000 to 80,000 PPM in D007 waste are quite routine, and typically average around 30,000 PPM. The background document written by EPA for development of BDAT for chromium waste D007 (Docket Document No. LD12-S1050) confirms the information we are presenting here, that D007 waste can contain as high as 700,000 PPM chromium, and consist of solids, sludges as well as liquids. In contrast, the untreated K062 waste on which BDAT is based averages only 1500 PPM Cr (See Table 5-2, page 5-5 of EPA's chromium BDAT background document - Docket #LD12-S1050).

Comment Number: 8-A-18 (Con't)
Docket Number: LD12 - 00172
Commenter: Hazardous Waste Treatment Council
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

For these D007 waste streams the HWTC feels that the higher concentration of chromium coupled with the more complex physical and chemical matrix makes these more difficult to treat than the K062 waste streams from which EPA tech transferred the BDAT standard. The non-wastewater treatment standard should really be set in the range of 0.3 to 0.8 PPM, not at 0.094 PPM. Two of our member companies have presented data on chromium reduction, followed by precipitation, vacuum filtration and stabilization of the non-wastewater residuals remaining. The HWTC urges EPA to consider this data submitted by these companies in setting more appropriate BDAT treatment standards.

The HWTC does not feel that the EPA should promulgate the F006 standard as an alternative, and agrees with EPA's comments on the inappropriateness of this technology transfer. We also do not feel that K062 is appropriate, and members have presented data to provide EPA a data set that is truly based on the restricted waste D007.

COMMENT NUMBER: 8-A-18
DOCKET NUMBER: LS12-00172
COMMENTER: Hazardous Waste Treatment Council
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency acknowledges the commenter's remarks concerning the 0.094 mg/l proposed treatment standard for D007 nonwastewaters. The commenter believes that the proposed standards are not routinely achievable due to the vast differences in the waste matrices versus the K062 waste on which the proposed standards were based.

EPA decided that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out that many D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the comments and performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters.

Based on the data submitted to the Agency during the comment period, the Agency was able to calculate a treatment standard of 4.3 mg/l for D007 nonwastewaters. This treatment standard was, in fact. calculated based on stabilization treatment data submitted by the commenter and Cyanokem Corporation's data from chromium reduction followed by precipitation, vacuum, filtration, and stabilization of the nonwastewater resudues (see Docket Numbers LD12-00050 and LD12-00020 respectively). However, the Agency determined that only 10 data points from the commenter's data submission for D007 nonwastewaters were complete in data quality meeting the BDAT criteria. This is due to the fact that although the untreated total chromium concentrations were given for the data

COMMENT NUMBER: 8-A-18 (continued)
DOCKET NUMBER: LS12-00172
COMMENTER: Hazardous Waste Treatment Council
ISSUE: 8-Chromium (D007)
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RESPONSE

package, only 10 data points were available for the untreated TCLP value from five waste streams. This was determined from review of Table II and Attachment I of the HWTC's data under Docket Number LD12-00050. The untreated TCLP values are necessary for comparing the corresponding treated TCLP values in order to determine if stabilization is effective. However, the commenter's data contained an additional 32 incomplete treatment data points (no TCLP analyses) many of which could not meet the 0.74 mg/l treatment standard based on the 10 data points from HWTC or the 0.86 mg/l treatment standard based on Cyanokem's 10 data points. Assuming that these additional 32 data points represent valid treatment, the Agency decided that both the 0.86 mg/l and the 0.74 mg/l standards calculated on just 20 data points were not routinely achievable. The Agency found that it was difficult to ascertain (per treatment facility) the mixing ratios of waste volumes that were received from each of the different industries. While the data indicate that some wastes contained very high concentrations of chromium, the lack of information on mixing ratios and feed rates make it difficult to assess the true effectiveness of treatment (i.e, the Agency could not determine the chromium concentration of the mixed D007 waste prior to treatment.

The Agency points out that the data from Cyanokem represented primarily treatment of liquid wastes (some with very high concentrations of chromium). Some of the sludges generated from this process did not require further treatment (i.e., stabilization). This same situation occurred in generating the promulgated treatment standards for K062

COMMENT NUMBER: 8-A-18 (continued)
DOCKET NUMBER: LS12-00172
COMMENTER: Hazardous Waste Treatment Council
ISSUE: 8-Chromium (D007)
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RESPONSE

wastes, in that the wastewater treatment process employed for treating the combined K062/D007 wastes was effective enough that the treatment sludges were not characteristic for chromium and did not require any further stabilization. (Thus, the derivation of the 0.094 mg/l proposed standard for D007 wastes.) While Cyanokem's data clearly indicated that the proposed 0.094 mg/l could not be achieved and thus implying that their combined D007 wastes were more difficult to treat, their data did not represent wastes similar to those represented by the HWTC data which was comprised primarily of sludge stabilization data.

As a result of these comments and data, EPA is withdrawing both of the proposed treatment standards for D007 wastes (i.e., the transfer from F006 and from K062). While the Agency contemplated promulgating the 5.2 mg/l F006 standard, it is even closer to the characteristic level than the 4.3 mg/l calculated using the commenter's data (i.e., Cyanokem data and 42 data points from HWTC). The treatment standard promulgated today, therefore, is set at 5.0 mg/l chromium (total) (as measured by TCLP). While the majority of commenters supported this approach from a policy standpoint, the Agency is convinced that the available data submitted by them clearly indicate the validity of the achievability of this standard.

Although all the D007 data received by the Agency were not considered for calculating a treatment standard, these data did suggest much variability in treatment for D007 nonwastewaters for further details on the data received for treatment of D007 wastes see the Final Best

COMMENT NUMBER: 8-A-18 (continued)
DOCKET NUMBER: LS12-00172
COMMENTER: Hazardous Waste Treatment Council
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

Demonstrated Available Background Document (BDAT) for chromium wastes D007 and U032. Many commenters expressed concerns that due to the fact that D007 waste matrices are so diverse i.e., high total chromium concentrations, greater percentages of hexavalent chromium, and the presence of complexing agents in some D007 waste streams), the diversity will prevent them from routinely achieving the proposed standard. Some commenters suggested that even the alternate 5.2 mg/l standard from the stabilization treatment of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level and 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-19
Docket Number: LD12-00187
Commenter: Chemical Manufacturers Association
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

The Proposed Treatment Standard For D007 Nonwastewaters Cannot Be Achieved On Chromium-Containing Metal Catalyst Wastes, And Should Be Increased To 5.2 mg/l.

EPA proposes a treatment standard of 0.094 mg/l of chromium (total) in D007 nonwastewaters. See 54 Fed. Reg. at 48,437/2. This level cannot be achieved for chromium-containing D007 metal catalyst nonwastewaters using the technology EPA relies upon to establish this very low treatment standard.

The proposed treatment standard of 0.094 mg/l is based on analysis of TCLP extracts and on the performance of chromium reduction followed by lime and sulfide precipitation and dewatering for K062 waste. See 54 Fed. Reg. at 48,437/2. EPA seeks comment on whether this treatment standard is achievable for all D007 nonwastewaters. Id. If comments indicate that this standard is not achievable, EPA states that it may promulgate a 5.2 mg/l treatment standard based on stabilization of F006 nonwastewaters. Id.

Comment Number: 8-A-19 (Con't)
Docket Number: LD12-00187
Commenter: Chemical Manufacturers Association
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

One member company treats its D007 spent metal catalyst pressed sludges by applying the same treatment train upon which EPA relies -- chromium reduction followed by lime and sulfide precipitation and dewatering. The company has analyzed 54 EP extracts of the waste taken over a five-month period during 1989. The data indicate that the proposed 0.094 mg/l treatment standard is far lower than can normally be achieved for metal catalyst wastes that contain chromium how much. The levels actually achieved range from 10.4 mg/l to 0.01 mg/l. Twelve of the 54 extracts exceeded 1 ppm. The relevant portions of this data appear in Attachment 1. 1/

1/ In 1985, another member company performed the same treatment steps on metal catalyst waste containing chromium. The treatment reduced the total chromium typically between 0.5 and 1.0 mg/l. This also shows that the 0.094 mg/l standard cannot be achieved.

Comment Number: 8-A-19 (Con't)
Docket Number: LD12-00187
Commenter: Chemical Manufacturers Association
Issue: 8 - Chromium (D007)
Subissue: treatment Standards
Comment:

It is noteworthy that these results were based on EP extracts instead of TCLP extracts. TCLP extract levels would likely be higher because of the increased agitation that is required in the TCLP.

In addition to the actual data presented above on metal catalyst waste containing chromium, we question the data upon which EPA bases its very low 0.094 mg/l treatment standard. EPA notes that stabilization of F006 nonwastewaters will not achieve the level of 0.094 mg/l but only a much higher level of 5.2 mg/l. EPA suggests that this may be because the F006 waste contains hexavalent chromium which is more soluble than trivalent chromium. But EPA also has data indicating that chemically stabilized K048-K052 nonwastewaters cannot achieve the very low 0.094 mg/l standard either. Treatment of these wastes only achieves 1.7 mg/l. Thus, at least two wastes with well-defined characteristics cannot be treated to the proposed standard based on the Agency's own data. Based on the Panel member data, treatment of metal catalyst nonwastewaters containing chromium cannot achieve those low levels either, but rather often achieves levels above 1 ppm.

Accordingly, we urge EPA to abandon the proposed 0.094 mg/l level and to establish the treatment standard for D007 nonwastewaters at 5.2 mg/l based on the data for stabilization of F006 wastes.

Comment Number: 8-A-19 (Cont.)

Docket Number: LD12-00187

Commenter: Chemical Manufacturers Association

Issue: 8- Chromium (D007)

Subissue: Treatment Standards

Comment:

1989 PRESS CAKES / WEST PLANT

EP Toxic

DATE	DUMPSTER	PRESSES	Cr	Cu	Fe	Ni
				ACETIC ACID LEACH (ppm)		
2/14	[illegible]	1	0.03			
2/15	[illegible]	3-4	0.06			
2/16	[illegible]	5-6	0.10			
2/17	2	1-3	0.01			
2/19	West		4.8			
2/21	West		2.5			
2/22	West	5	0.08			
2/22	West	6	0.16			
2/23	1	1	0.23			
2/23	[illegible]	1	0.11			
2/23	[illegible]	2-3	0.01			
2/24	[illegible]	4-5	0.36			
2/27						
2/27	West		0.07			
2/28			0.01			
3/1	2	1	12			
3/1	[illegible]	2-3	1.2			
3/6	1	4-5	0.45			
3/3	[illegible]	1-5	0.02			
3/6	[illegible]	1-6	1.0			
3/7	[illegible]	1-5	0.60			
3/13	[illegible]	1-6	0.76			
3/20	[illegible]	1-5	1.5			
3/22	[illegible]	1-6	0.30			
3/23	2	1-5	0.10			
3/30	[illegible]	1-6	0.6			
4/3	[illegible]	1-6	0.13			
4/6	[illegible]	1-5	0.26			
4/7	[illegible]	1-6	0.20			
4/10	[illegible]	1-5	0.07			
4/13	[illegible]	1-6	0.2			
4/18	[illegible]	1-6	3.6			
4/21	[illegible]	1-6	0.30			
4/21	[illegible]	1-5	0.27			
4/28	[illegible]	1-6	0.06			
5/2	[illegible]	1-5	0.4			
5/13	[illegible]	1-6	0.04			
5/22	[illegible]	1-6	0.02			
5/23	[illegible]	1-5	0.03			
5/27	[illegible]	1-6	2.5			
5/31	[illegible]	1-6	0.16			
6/6	[illegible]	1-6				
6/6	[illegible]	1-5	0.01			
6/9	[illegible]	1-6	0.66			
6/13	[illegible]	1-6	1.1			
6/15	[illegible]	1-5	1.0			
6/19	[illegible]	1-5	0.64			
6/23	[illegible]	1-6	0.90			
6/23	2	1-3	0.01			
6/29	2	1-6	0.07			
6/29	2	1-5	0.04			
7/3	2	1-5	1.0			
7/7	[illegible]	1-6	10.4			
7/10	[illegible]	1-6	0.7			

COMMENT NUMBER:	8-A-19
DOCKET NUMBER:	LD12-00187
COMMENTER:	Chemical Manufacturers Association
ISSUE:	8-Chromium (D007)
SUBISSUE:	Treatment Standards

RESPONSE

EPA decided that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out that many D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters.

Based on the data submitted during the comment period, the Agency was able to calculate a treatment standard of 4.3 mg/l for D007 nonwastewaters. Details on the assessment of the D007 treatment performance data submitted to the Agency during the comment period may be found in the BDAT Document for Chromium Waste D007 and U032.

After review of all the treatment performance data and comments received for D007 wastes, the Agency believes that there are vast differences in the K062 (from which the proposed standard was derived) waste and D007 waste.

Because of this diversity (i.e., high total chromium content, higher percentages of hexavalent chromium, and the presence of complexing agents), many commenters believed that the proposed D007 nonwastewater standard of 0.094 mg/l may not be routinely achievable.

COMMENT NUMBER: 8-A-19 (continued)
DOCKET NUMBER: LD12-00187
COMMENTER: Chemical Manufacturers Association
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters and the characteristic level of 5.0 mg/l in the TCLP leachate and wastewater at 5.0 total concentration. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule), can be treated to this level. In addition, although these data are too imprecise (by far) to use to develop a treatment standard, they are suggestive of difficulties in treating chromium waste and the variety of wastes included under the D007 waste code. Although these data were not used to develop the D007 nonwastewater treatment standards, a standard derived from these data would be 20 mg/l in the TCLP leachate.

Comment Number: 8-A-20
Docket Number: LD12-00195
Commenter: Covington & Burling
Issue: 8-Chromium (D007)
Subissue: Treatment Standards
Comment:

II. The Proposed Treatment Standard For Nonwastewater D007 Wastes Cannot Be Achieved By All Wastes In This Treatability Group

U.S. EPA has proposed as a treatment standard for nonwastewater D007 the TCLP concentration of 0.094 mg/l even though it has data indicating that this standard cannot be met by all D007 nonwastewaters. Furthermore, U.S. EPA has identified as BDAT for nonwastewater D007 a treatment method that is not available for all wastes in this treatability group. As is demonstrated below, U.S. EPA should raise the treatment standard to a level that can be met by all D007 nonwastewaters and should adopt a national capacity variance for those types of D007 nonwastewaters for which there is no best demonstrated available treatment.

A. The Only Technically Defensible Treatment Standard For D007 Nonwastewaters Is The 5.2 mg\l Concentration Established For F006 Nonwastewaters.

In the Background Document for the proposed BDAT for D007 wastes, F89-LD12-S1050 (1989) (hereinafter D007 Background Document), U.S. EPA states that, following a careful review of the generation of D007 wastes and available waste characterization data, it has determined that all D007 nonwastewaters form a single treatability group. D007 Background Document at 2-9. Despite this finding, the Agency has selected a treatment standard which it knows cannot be met by all D007 nonwastewaters. See D007 Background Document at 1-3.

The Agency obtained its proposed standard for D007 nonwastewaters by transferring the performance data for K062 wastes to D007 nonwastewaters. 54 Fed. Reg. at 48437. To transfer the performance data of one waste to another, the Agency must determine that "the constituents present in the subject waste can be treated to the same performance levels as those observed in other wastes for which EPA has previously developed treatment data." Methodology for Developing Best Demonstrated Available (BDAT) Treatment Standards, EPA\530-SW-89-017L (1988) (hereinafter BDAT Methodology Document); see also D007 Background Document at 4-1. In the case

Comment Number: 8-A-20 (Cont)
Docket Number: LD12-00195
Commenter: Covington & Burling
Issue: 8-Chromium (D007)
Subissue: Treatment Standards
Comment:

of D007 wastes, the transfer of performance data from K062 wastes is inappropriate because U.S. EPA has data from two other waste groups that indicate that the K062 standard of 0.094 mg\l cannot be met by all chromium-containing wastes.[3]

First, as the Agency acknowledges, it has performance data from the stabilization of F006 nonwastewaters that indicate that the chromium from these wastes cannot be treated to a level below 5.2 mg/l. The Agency states that it believes that F006 wastes contain the more soluble hexavalent chromium and are therefore less treatable. 54 Fed. Reg. at 48437. However, U.S. EPA has made no finding that D007 wastes do not contain hexavalent, rather than trivalent, chromium.[4] Indeed, the Agency expressed its intent to regulate chromium without distinguishing between the hexavalent and trivalent states. 54 Fed. Reg. at 48436. Thus, it must set a performance standard that can be met by D007 wastes containing chromium in either state.

Second, although the Agency has failed to note this fact in the proposed rule, U.S EPA has performance data on chromium-containing K048-K052 nonwastewaters that form the basis for a treatment standard of 1.7 mg/l, over 18 times higher than the proposed D007 standard. See EPA/530-SW-88-031C.

Thus, there are two wastes for which EPA has performance data that indicate that the proposed standard for D007 nonwastewaters cannot be met by all nonwastewaters containing characteristic levels of chromium. In such a case, the Agency cannot justify the transfer of performance data from a single waste to establish the performance standard for an entire category of characteristic wastes. U.S. EPA's own data indicates that 5.2 mg/l is the lowest chromium concentration achievable by all D007 nonwastewaters.[5] As such, the 5.2 mg/l concentration should be established as the treatment standard for this treatability group. Furthermore, such a treatment standard is within U.S. EPA's legal authority to require as it is above the characteristic level for chromium. See Part I, above.

Comment Number: 8-A-20 (Con't)
Docket Number: LD12-00195
Commenter: Covington & Burling
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

3/ Furthermore, as is demonstrated in Subpart B, below, U.S. EPA has not fully characterized D007 nonwastewaters. Therefore, under its own standard, the transfer of performance data is inappropriate. This entire rulemaking is hampered by a lack of data requiring the Agency to "transfer" treatment standards to wastes for which it has no treatment data. U.S. EPA should instead work with industry to develop the necessary data on which to make rational, defensible judgments concerning treatment standards.

4/ As is discussed below, this assumption is not true for all D007 nonwastewaters; OCF's D007 nonwastewaters contain hexavalent chromium.

5/ As is discussed in Subpart B, below, at the present time, not all D007 nonwastewaters can meet this treatment standard due to lack of available treatment facilities.

COMMENT NUMBER: 8-A-20
DOCKET NUMBER: LD12-00195
COMMENTER: Covington & Burling
ISSUE: 8-Chromium (D007)
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RESPONSE

The Agency thanks the commenter for their concerns and remarks on the proposed D007 nonwastewater standard. The commenter, as with many other commenters, believes that the proposed standard of 0.094 mg/l cannot be achieved. They believe that this is due to the many differences in the waste matrices versus the K062 waste on which the proposed D007 standards were based.

EPA decided that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out the many D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters.

Based on the data submitted during the comment period, the Agency was able to calculate a treatment standard of 4.3 mg/l for D007 nonwastewaters. The bulk of these data submitted during the comment period did not meet EPA's criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularly untreated TCLP for corresponding treated TCLP concentrations; most of the commenters fail to provide untreated TCLP data, 2) no Quality Assurance/Quality Control (QA/QC) data and 3) lack of design and operations information of D007 wastes. Therefore, the Agency rejected much of the data for consideration of a standard. The data evaluated

COMMENT NUMBER: 8-A-20 (continued)
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to determine a 4.3 mg/l treatment level represents only a small fraction of the total data received on treatment of D007 wastes. Details on assessment of the data are presented in the Final Best Demonstrated Available Background Document (BDAT) for Chromium Wastes D007 and U032.

Although these data were not considered for calculating a treatment standard, the data suggested much variability in treatment for D007 nonwastewaters. Many commenters expressed concerns that due the fact that D007 waste matrices are so diverse (i.e., high total chromium concentrations, greater percentages of hexavalent chromium, and the presence of complexing agents in some D007 waste streams), the diversity will prevent them from routinely achieving the proposed standard. Some commenters suggested that even the alternate 5.2 standard from the stabilization treatment of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-21
Docket Number: LD12-L0007
Commenter: Chemical Manufacturers Association
Issue: 8- Chromium (D007)
Subissue: Treatment Standards
Comment:

EPA's Proposed Treatment Standard for Chromium-Bearing Wastewaters (D007) Is Based on Data for Treatment of K062 Waste at a Single Facility. Extensive Wastewater Treatment Data From the Agency's Office Of Water Database Show That the Proposed Standard Cannot Be Achieved.

EPA's proposed treatment standard for D007 wastewaters is a maximum grab sample concentration of 0.32 mg/l, based on data collected for K062 wastewater at a single facility~~. -~~ 54 Fed. Reg. at 48,437. A total of 11 grab samples were use~~d to~~ derive this standard (proposed BDAT background document, LDR7-S0348, April 1988).

The alternate concentration-based D007 wastewater treatment standard calculated by EPA is 0.37 mg/l as a 24-hour composite sample. This standard is based on extensive, long-term treatment data collected by the Office of Water for the same type of treatment system that was used for the K062 wastewater (Table 4-123, Background Document for wastewaters containing BDAT list constituents (LD12-S1061). While the difference between the measured values is slight, the difference in standards is greater than it appears to be. Because of the difference in sampling frequency. The difference in the two sets of limits is undoubtedly based on process variability. It is virtually impossible to adequately characterize process variability with 11 grab samples collected over a very short time period.

Comment Number: 8-A-21 (cont)
Docket Number: L012-L0007
Commenter: Chemical Manufacturers Association
Issue: 8-Chromium (D007)
Subissue: Treatment Standards
Comment:

If EPA ignores the legal impediments and promulgates a treatment standard for chromium in wastewaters at less than the characteristic level, it should base that standard on the OSW wastewater data and promulgated the 0.37 mg/l alternate concentrations presented in section III.A.7. of the proposed rule. 54 Fed. Reg. at 48,461.

Comment Number: 8-A-21 (con't)
Docket Number: LD12-L0007
Commenter: Chemical Manufacturers Association
Issue: 8-Chromium (D007)
Subissue: Treatment Standards
Comment:

6. EPA's K062 Database is Inadequate and Its Use Has Resulted in Improperly Established Standards.

EPA has used the K062 wastewater treatment data to propose BDAT standards for a number of characteristic and listed wastes (for example, K061 at 54 Fed. Reg. at 48,456). CMA reminds the Agency that the entire K062 wastewater database consists of just 11 samples.

In contrast, and as admitted by EPA, the wastewater treatment data collected for the multi-source leachate standards (Background Document for wastewaters containing BDAT list constituents (LD12-S10610)) are extensive, both in the number of individual entries and in the length of the performance records. Therefore, for a given treatment technology and hazardous constituents, the wastewater treatment data accumulated for multi-source leachate provide a much more reliable basis for evaluating the capabilities of technologies that are available and demonstrated.

The EPA should not use K062 data to establish standards for metals in any listed or characteristic wastewater other than K062. EPA should set wastewater performance data for all hazardous constituents using the treatment standards developed for multi-source leachate.

Comment Number: 8-A-21 (cont.)
Docket Number: LD12-L0007
Commenter: Chemical Manufacturers Association
Issue: 8 - Chromium (D007)
Subissue: treatment Standards
Comment:

The Agency's Proposed Treatment Standard for Chromium-Bearing D007 Nonwastewaters Is Not Technically Supported for the Universe of D007 Nonwastewaters.

The Agency's proposed standard for D007 nonwastewaters is based on the K062 database. 54 Fed. Reg. at 48,437. EPA acknowledges that it has data for stabilizing of F006 nonwastewaters that demonstrate that the proposed standard cannot be met because the F006 waste may have contained hexavalent chromium which is more soluble than trivalent chromium.

The Agency has failed to note that the treatment standards for chemically-stabilized K048-K052 nonwastewaters are over 18 times higher than the proposed D007 standard (EPA/530-SW-88-031C). Thus, EPA itself identifies stabilization data at least two wastes that cannot achieve the proposed standard based on K062 nonwastewaters.

This result forcefully demonstrates the flaws in the Agency's methodology for characteristic, "U", and "P" wastes. The Agency should not use a single waste to establish a standard for an entire universe of dissimilar wastes, especially when the Agency's own BDAT analysis demonstrates at least two wastes within the universe cannot be treated to the proposed standard.

Treatment Standards for a universe of characteristic "P" and "U" wastes should be based on the most-difficult-to-treat waste in that universe. Hence, EPA should set the treatment standard for D007 nonwastewaters at the 5.2 mg/l concentration established for F006 nonwastewaters.

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DOCKET NUMBER:	LD12-L0007
COMMENTER:	Chemical Manufacturers Association
ISSUE:	8-Chromium (D007)
SUBISSUE:	Treatment Standards

RESPONSE

The Agency did not receive any data on the treatment of D007 wastewaters that met the Agency's criteria for quality, i.e., proper Quality Assurance/Quality Control (QA/QC), paired untreated and treated data points, and design and operating conditions data. The alternate concentration-based D007 wastewater treatment data from the EPA's Office of Water is composite data and does not specifically represent treatment of a D007 wastewater.

For the final rule, EPA is recognizing the diversity of waste that qualify as hazardous under the D007 classification. Because of this diversity, the Agency has chosen to regulate D007 wastewaters at the characteristic level of 5.0 mg/l total concentration.

The Agency acknowledges the commenter's remarks stating that the proposed D007 nonwastewater standard based on K062 data is flawed. The commenter pointed out that the D007 nonwastewaters and the K062 waste stream are very dissimilar waste matrices.

EPA decided that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out how much D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable.

COMMENT NUMBER: 8-A-21 (continued)
DOCKET NUMBER: LD12-L0007
COMMENTER: Chemical Manufactures Association
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency acknowledges the commenter's remarks stating that the 0.094 ppm treatment standard for D007 nonwastewaters can not be achieved on chromium-containing metal catalyst wastes. The commenter, therefore, requested a treatment standard of 5.2 mg/l based on F006 treatment performance data. The commenter submitted D007 treatment performance data consisting of a similar treatment train that was used to treat the K062 wastes (chromium reduction followed by lime and sulfide precipitation and dewatering). The 52 data points (not 54 cited by the commenter) submitted by the commenter were not used to develop the D007 treatment standard. These data were essentially just treated effluent concentrations with no influents, Quality Assurance/Quality Control (QA/QC), or any other data which EPA's methodology requires for analysis.

Although these data are deficient in information they are suggestive of difficulties in treatment of chromium waste and the variety of wastes under the D007 waste code. Although these data were not used to develop the D007 nonwastewater treatment standards, standards derived from these data would be 20 mg/l based on the TCLP extract.

EPA decided that the D007 proposed nonwastewater treatment standard of 0.094 mg/l based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out that the D007 waste streams differed significantly from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for

COMMENT NUMBER:	8-A-21 (continued)
DOCKET NUMBER:	LD 12-00187
COMMENTER:	Chemical Manufactures Association
ISSUE:	8-Chromium (D007)
SUBISSUE:	Treatment Standards

RESPONSE

treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters.

Based on the data submitted during the comment period, the Agency was able to calculate a treatment standard of 4.3 mg/l for D007 nonwastewaters. The bulk of these data did not meet EPA's criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations, particularly untreated TCLP for corresponding treated TCLP concentrations; most of the commenters failed to provide untreated TCLP concentrations, 2) no Quality Assurance/Quality Control (QA/QC) data and, 3) lack of design and operations information of D007 wastes. Therefore, the Agency rejected much of these data for consideration of a standard. As a result, the data evaluated to determine 4.3 mg/l treatment level represent only a small fraction of the total data received on treatment of D007 wastes. Details on assessment of these data is presented in the Final Best Demonstrated Available Background Document (BDAT) for chromium wastes D007 and U032.

Although most data were not considered for calculating a treatment standard, the data did suggest much variability in treatment for D007 nonwastewaters. Many commenters expressed concerns that due to the fact that D007 waste matrices are so diverse i.e., high total chromium concentrations, higher percentage of hexavalent chromium, and the presence of complexing agents in some D007 waste streams, the diversity will prevent them from routinely achieving the 0.094 mg/l proposed

COMMENT NUMBER: 8-A-21 (continued)
DOCKET NUMBER: LD 12-00187
COMMENTER: Chemical Manufactures Association
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
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standard. Some commenters suggested that even the alternate 5.2 standard from treatment of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters and wastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule) can be treated to this level.

Comment Number: 8-A-22
Docket Number: LD12-00274
Commenter: COLLIER, SHANNON & SCOTT
Issue: 8-Chromium (D007)
Subissue:
Comment: TREATMENT STANDARDS

2. **Alternatively, EPA should set methods of treatment rather than specific concentration limits for wastes hazardous by characteristic (particularly for D007 and D008 wastes) because of the broad range of different wastes in these categories that will be unable to meet the proposed limits.**

As EPA recognizes in the preamble, significant technical differences, gaps in data, and the sheer diversity and breadth of wastes under a single characteristic designation make it very difficult to promulgate treatment standards for a particular characteristic. Although EPA can often identify a certain process, or alternative processes as BDAT for a particular characteristic, extrapolating exact, accurate standards for myriad wastes is virtually impossible. In most instances, EPA has simply transferred data from a single waste code treated by a BDAT process to all wastes that exhibit a characteristic which the selected waste code also typically exhibits. The problem with this approach is that it fails to account for the enormous range and variation of individual types of wastes in a single designated characteristic.

The proposed rule adopts a treatment standard for all D007 (chromium) wastewaters and nonwastewaters based solely on data on K062 wastes treated by chemical precipitation. In the preamble, the Agency states its belief that K062 would be similar or more difficult to treat than D007 wastes because of the high concentration of chromium and other metals in K062 wastes. The Agency's reasoning is flawed in several respects. First, the mere fact that K062 wastes contain high levels of chromium does not mean that all D007 wastes can be treated to the same levels as K062. As the preamble notes, F006 wastes (which contain similar chromium concentrations as K062 wastes) can only be stabilized to meet a 5.2 mg/l (TCLP) standard for chromium. This is because factors other than chromium concentration will also significantly affect the ability of these various D007 wastes to meet chromium TCLP standards. For example, D007 wastes which have a high pH will require acidic rather than lime addition and will be more difficult to treat by precipitation than wastes such as K062 which have a low pH because acids, unlike lime, do not function as flocculents.

Comment Number: 8-A-22 (con't)
Docket Number: LD12-00274
Commenter: COLLIER, SHANNON & SCOTT
Issue: 8 - CHROMIUM (D007)
Subissue: TREATMENT STANDARDS
Comment:

A far better regulatory approach for EPA to adopt would be to set treatment methods, rather than specific concentration levels as treatment standards for characteristic wastes (or at least those characteristic wastes such as D007 and D008 on which there is insufficient data and for which EPA has proposed concentration limits that are impossible for most wastes to meet). EPA correctly notes that section 3004(m) of RCRA provides EPA with the discretion to promulgate land disposal pretreatment standards expressed either as concentration levels or as treatment methods.[3] In fact, EPA has proposed to establish treatment standards expressed as a treatment process, or alternative treatment processes for more than a hundred wastes in proposed section 40 C.F.R. § 268.42.

We generally support the adoption of these alternative methods of treatment. Industry should be provided with a choice of acceptable treatment processes whenever possible to create competition in the treatment industry and to ensure that a single treatment process or company does not become a monopoly with a market created by government mandate.[4] Consequently, we recommend that EPA adopt stabilization or thermal metals recovery as alternative treatment standards for all D007 and D008 nonwastewaters and chemical precipitation for all D007 and D008 wastewaters. Even if the Agency only adopted these measures as an interim final, it would provide the Agency with the needed time to adopt valid concentration limits for specific wastes in the future after more data becomes available.

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[3] In the recent decision of Hazardous Waste Treatment Council v. U.S. EPA, 886 F.2d 355, 361 (D.C. Cir. 1989), the Court noted that:

> The statute [RCRA] directs EPA to set treatment standards based upon either "levels or methods" of treatment. Such a mandate makes clear that the choice whether to use "levels" (screening levels) or "methods" (BDAT) lies within the informed discretion of the agency.

[4] Generally, EPA attempts to provide this flexibility and competition by specifying treatment standards expressed as concentrations, thus allowing industry to choose among technologies capable of achieving the desired concentration limits. While this may work for specific waste codes, it does not work for broad categories of characteristic wastes. In this case, EPA should specify an array of treatment methods and allow generators to choose the one most applicable and effective for its own wastes.

Comment Number: 8-A-22 (con't)
Docket Number: LD12-00274
Commenter: COLLIER, SHANNON & SCOTT
Issue: 8-Chromium (D007)
Subissue: Treatment Standards
Comment:

3. **Because the Background Document on which EPA relies in setting treatment standards for D007 nonwastewaters are flawed, EPA should set a method of treatment, rather than the proposed concentration levels for these wastes.**

The validity of the D007 Background Document, particularly with regard to K062 precipitation, is subject to challenge. It is incongruous that the data on K062 wastewaters treated by chemical precipitation indicate a chromium TCLP level three times higher than K062 nonwastewaters treated by the same process. (Compare Table 5-2 and 5-3 of the November 1989 Background Document for Chromium Wastes D007). Moreover, although the TCLP calculations for treated K062 nonwastewaters are all identical (<0.050) for all 11 samples in Table 5-2 of the Background Document, the accuracy-adjusted TCLP level for these identical samples differ from .074 to 0.10. Because the data on which EPA relies is flawed, we recommend that EPA set the treatment method of chemical precipitation for D007 nonwastewaters rather than the proposed concentration levels.

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DOCKET NUMBER: LD12-00274
COMMENTER: Collier, Shannon, and Scott
ISSUE: 8-Chromium (D007)
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RESPONSE

The Agency acknowledges the commenter's remarks in which they stated that because of the vast differences in D007 waste, K062 will not represent the universe of D007 waste, which in some instances will be unable to meet the proposed limits. The commenter suggested that as an alternative to concentration based standards, the Agency should establish methods of treatment.

The Agency chooses to establish concentration-based treatment standards wherever possible. EPA believes that concentration-based treatment standards provide more flexibility in treating wastes. However, EPA determined that the proposed nonwastewater treatment standard of 0.094 mg/l based on K062 data may not be appropriate for all D007 waste streams differed significantly from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters.

Based on the data submitted to the Agency during the comment period, the Agency was able to calculate a treatment standard of 4.3 mg/l for D007 nonwastewaters. The bulk of the data did not meet EPA criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularly untreated TCLP for corresponding treated TCLP concentrations; most of the commenters failed to provide untreated data, 2) no Quality Assurance/Quality Control (QA/QC) data, and 3) lack of design and operations information. Therefore, the Agency rejected much

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of the data for consideration of a standard. As a result, the data evaluated to determine the achievable 4.3 mg/l treatment level represents only a small fraction of the total data received on treatment of wastes. Details on assessment of these data are presented in the Final Best Demonstrated Available Background Document (BDAT) for Chromium Wastes D007 and U032.

Although most of the data were not used to develop a possible treatment level, the data did suggest much variability in treatment for D007 nonwastewaters. Many commenters expressed concerns that due the fact that D007 waste matrices are so diverse (i.e., high total chromium levels, higher proportions of hexavalent chromium, and the presence of complexing agents in some D007 waste streams), this diversity will prevent them from routinely achieving the proposed standard of 0.094 mg/l for D007 nonwastewaters. Some commenters suggested that even the alternate standard of 5.2 from treatment of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007 classification. Because of this diversity, EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-23
Docket Number: LD12-00276
Commenter: Specialty Steel Industry of the U.S.
Issue: 8- Chromium (D007)
Subissue: Treatment Standards.
Comment:

Alternatively, EPA should set methods of treatment rather than specific concentration limits for wastes hazardous by characteristic (particularly for D007 and D008 wastes) because of the broad range of different wastes in these categories that will be unable to meet the proposed limits.

As EPA recognizes in the preamble, significant technical differences, gaps in data, and the sheer diversity and breadth of wastes under a single characteristic designation make it very difficult to promulgate treatment standards for a particular characteristic. Although EPA can often identify a certain process, or alternative processes as BDAT for a particular characteristic, extrapolating exact, accurate standards for myriad wastes is virtually impossible. In most instances, EPA has simply transferred data from a single waste code treated by a BDAT process to all wastes that exhibit a characteristic which the selected waste code also typically exhibits. The problem with this approach is that it fails to account for the enormous range and variation of individual types of wastes in a single designated characteristic.

The proposed rule adopts a treatment standard for all D007 (chromium) wastewaters and nonwastewaters based solely on data on K062 wastes treated by chemical precipitation. In the preamble, the Agency states its belief that K062 would be similar or more difficult to treat than D007 wastes because of the high concentration of chromium and other metals in K062 wastes. The Agency's reasoning is flawed in several respects. First, the mere fact that K062 wastes contain high levels of chromium does not mean that all D007 wastes can be treated to the same levels as K062. As the preamble notes, F006 wastes (which contain similar chromium concentrations as K062 wastes) can only be stabilized to meet a 5.2 mg/l (TCLP) standard for chromium. This is because factors other than chromium concentration will also significantly affect the ability of these various D007 wastes to meet chromium TCLP standards. For example, D007 wastes which have a high pH will require acidic rather than lime addition and will be more difficult to treat by precipitation than wastes such as K062 which have a low pH because acids, unlike lime, do not function as flocculents.

The different chemical and physical composition of D007 wastes will also significantly affect the ability of those wastes to be treated to meet the proposed land disposal standards. For example, steel manufacturers generate a waste known as kolene which exhibits the characteristic of EP Toxicity for chromium. Kolene is used in a caustic treatment process from which overflow is typically discharged into a steel company's wastewater treatment system. When the wastewater treatment system is periodically cleaned, certain containment liners that are disposed of often exhibit the EP Toxicity characteristic for chromium. It clearly will be impossible to treat these liners by chemical precipitation to meet the proposed .094 mg/l (TCLP) treatment limit for chromium.

Comment Number: 8-A-23 (Con't)
Docket Number: LD12-00276
Commenter: Specialty Steel Industry of the U.S.
Issue: 8 - Chromium (D007)
Subissue: Treatment Standards
Comment:

A far better regulatory approach for EPA to adopt would be to set treatment methods, rather than specific concentration levels as treatment standards for characteristic wastes (or at least those characteristic wastes such as D007 and D008 on which there is insufficient data and for which EPA has proposed concentration limits that are impossible for most wastes to meet). EPA correctly notes that section 3004(m) of RCRA provides EPA with the discretion to promulgate land disposal pretreatment standards expressed either as concentration levels or as treatment methods.[3] In fact, EPA has proposed to establish treatment standards expressed as a treatment process, or alternative treatment processes for more than a hundred wastes in proposed section 40 C.F.R. § 268.42.

We generally support the adoption of these alternative methods of treatment. Industry should be provided with a choice of acceptable treatment processes whenever possible to create competition in the treatment industry and to ensure that a single treatment process or company does not become a monopoly with a market created by government mandate.[4] Consequently, we recommend that EPA adopt stabilization or thermal metals recovery as alternative treatment standards for all D007 and D008 nonwastewaters and chemical precipitation for all D007 and D008 wastewaters. Even if the Agency only adopted these measures as an interim final, it would provide the Agency with the needed time to adopt valid concentration limits for specific wastes in the future after more data becomes available.

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[3] In the recent decision of Hazardous Waste Treatment Council v. U.S. EPA, 886 F.2d 355, 361 (D.C. Cir. 1989), the Court noted that:

> The statute [RCRA] directs EPA to set treatment standards based upon either "levels or methods" of treatment. Such a mandate makes clear that the choice whether to use "levels" (screening levels) or "methods" (BDAT) lies within the informed discretion of the agency.

[4] Generally, EPA attempts to provide this flexibility and competition by specifying treatment standards expressed as concentrations, thus allowing industry to choose among technologies capable of achieving the desired concentration limits. While this may work for specific waste codes, it does not work for broad categories of characteristic wastes. In this case, EPA should specify an array of treatment methods and allow generators to choose the one most applicable and effective for its own wastes.

COMMENT NUMBER: 8-A-23
DOCKET NUMBER: LD12-00276
COMMENTER: Specialty Steel Industry of the U.S.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency acknowledges the commenter's remarks requesting a method of treatment for D007 wastes. The commenter stated that Steel Manufacturers generate a waste product known as Kolene that qualify as a D007 waste. The commenter suggested that this waste will not be able to be treated by chemical precipitation to the proposed treatment standard of 0.094 mg/l.

EPA is not specifying that D007 wastes be treated by any particular treatment technology. The Agency, in today's rulemaking, is promulgating a concentration-based treatment standard of 5.0 mg/l TCLP (which is the characteristic level for D007 wastes). The Agency maintains that concentration-based treatment standards allows industry maximum flexibility in the treatment of their wastes. The commenter is reminded that if they have a waste that cannot be treated to the regulatory levels, then they may petition the Agency for a treatment variance.

EPA decided that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out that D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters. Based on the data submitted during the comment period, the Agency calculated a treatment standard of 4.3 mg/l

COMMENT NUMBER: 8-A-23 (Continued)
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RESPONSE

for D007 nonwastewaters. The bulk of these data did not meet EPA criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularily untreated TCLP for corresponding treated TCLP concentrations; most of the commenters failed to provide untreated TCLP concentrations 2) no Quality Assurance/Quality Control (QA/QC) data and 3) lack of design and operations information for their treatment system. Therefore, the Agency rejected much of these data for consideration of a standard. The data evaluated to determine 4.3 mg/l treatment level represents only a small fraction of the total data received on treatment of D007 wastes. Details on assessment of these data is presented in the Final Best Demonstrated Available Background Document (BDAT) for Chromium Wastes D007 and U032.

However, these data did suggest much variability in treatment for D007 nonwastewaters and many commenters expressed concerns that due the fact that D007 waste matrices is so diverse (i.e., high total chromium concentrations, higher percentages of hexavalent chromium, and the presence of complexing agents in some D007 waste streams) that the diversity will prevent them from routinely achieving the proposed standard. Some commenters suggested that even the alternate 5.2 mg/l standard from treatment of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007

COMMENT NUMBER: 8-A-23 (Continued)
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SUBISSUE: Treatment Standards
RESPONSE

classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate and wastewaters at 5.0 mg/l total concentration. EPA believes that even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-24

Docket Number: LO12-00217

Commenter: Collis Incorporated

Issue: 8- Chromium (D007)

Subissue: TREATMENT STANDARDS

Comment:

E.P.A. RCRA Docket (05-305)
U.S. Environmental Protection Agency
401 M. Street, S.W.
Washington DC 20460

RE: DOCKET NUMBER F-89-LD12-FFFFF

Dear Sir:

This letter is in response to the proposed ruling of the third third of hazardous wastes as published November 22, 1989, in the Federal Register.

Specifically, we as a manufacturer, object to the proposed ruling to lower the limit from 5.0 to 0.094 mg/l on the characteristic waste D007 (chrome bearing).

Our Company manufactures refrigerator shelves. We use a chloride zinc (non-cyanide) plating process to finish them. Along with the zinc plating we have to apply an immersion coating of chromate to enhance our corrosion resistance and provide a good paint and lacquer adhesion to the zinc.

We segregate our chrome bearing wastes from all other wastes. The chrome waste water is treated with sulfur dioxide to convert all hexavalent chrome to tri-valent chrome. Once this is accomplished, we precipitate the chrome out as chromium hydroxide using lime. At this point, we combine the chrome treated wastes with the remaining wastes, where we adjust our pH to approximately 9.0 with lime. The sludge produced by this method is dewatered to a solid cake.

Comment Number: 8-A-24 (con't)
Docket Number: LD12-00217
Commenter: Collis Incorp
Issue: 8- Chromium (D007)
Subissue: TREATMENT STANDARDS
Comment:

This sludge, for the past four years, has been non-hazardous based on E.P. toxicity tests (see attached analysis).

The following table summarizes chromium analysis on our sludge the past four years.

YEAR	TOTAL CHROMIUM (mg/kg)	E.P. TOXICITY (mg/l)	T.C.L.P.(mg/l)
1989	3800	No Analysis	0.21
1988	1376	.05	1.16
1987	1460	.05	
1986	3300	.05	

As can be seen by the results with the high concentration of total chromium in our sludge, both the E.P. Toxicity and the T.C.L.P. test results are very low.

With a present 5.0 mg/l limit for total chromium on an E.P. Toxicity test, our sludge is not hazardous. If a limit of 5.0 mg/l for total chromium based on a T.C.L.P. test was set, our sludge would still be considered non-hazardous.

If the Agency adopts the proposed chromium limit of 0.094 mg/l on a T.C.L.P. test, our sludge will become hazardous. We feel that our sludge is non-hazardous by today's standards. We are applying BDAT to our waste stream and solidifying the chromium with lime. This is the preferred E.P.A. method of treating chrome. We know of no other treatment methods at this time which will lower the T.C.L.P. results below the 0.094 mg/l proposed limit.

We urge the Agency to leave the limit at 5.0 mg/l for chromium and D007 non-waste waters.

COMMENT NUMBER: 8-A-24
DOCKET NUMBER: LD12-00217
COMMENTER: Collis Incorporated
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

EPA proposed standards for D007 nonwastewaters containing chromium of 0.094 mg/l, as measured in the extract by TCLP, for chromium (total) has been withdrawn in this final rule. EPA is instead promulgating a treatment standard of 5.0 mg/l, as measured in the extract by TCLP.

EPA's treatment standards promulgated for D007 wastes under the provisions of the 40 CFR Part 268 only applies to those wastes meeting the criteria classifying wastes as hazardous under Subtitle C of RCRA. EPA's criteria for classifying wastes as hazardous under RCRA are published in the 40 CFR Part 261.31, as amended by the March 29, 1990, 55 FR 11798. Wastes failing these listing criteria may be excluded from the land disposal restrictions finalized today and published under the 40 CFR Part 268. (States are authorized to impose additional restrictions than those imposed at the Federal level).

Comment Number: 8-A-25
Docket Number: LD12-00270
Commenter: ETICAM
Issue: 8- Chromium (D007)
Subissue: TREATMENT STANDARDS
Comment:

3. (3.A.5.e.) Chromium; page 48437

ETICAM has treated a large variety of chrome wastes, and the lower standard is not achievable for many chrome wastes, particularly if mixed with other plating wastes containing complexing agents. The level of 5.2 mg/l is difficult to achieve in some instances.

COMMENT NUMBER: 8-A-25
DOCKET NUMBER: LD12-00270
COMMENTER: Eticam
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

The Agency acknowledges the commenter's remarks noting that they have treated a large variety of chromium wastes stating that the 0.094 mg/l treatment standard for D007 nonwastewaters are not achievable. The commenter cited complexing agents in mixed plating waste as particularly difficult to achieve. However, the commenter did not provide treatment performance data to justify their contention that the proposed standard is not achievable, and that the alternative standard of 5.2 is difficult to achieve.

EPA decided that the proposed nonwastewater treatment standard based on K062 data may not be appropriate for all D007 waste streams although suitable for other waste streams such as the organo-metallic wastes. Many comments were received pointing out that D007 waste streams differed from the K062 waste. Accordingly, EPA reviewed all the performance data submitted for treatment of D007 wastes and determined from these data that the proposed standard of 0.094 mg/l may not be routinely achievable for all forms of D007 nonwastewaters.

Based on the data submitted during the comment period, the Agency was able to calculate a treatment standard of 4.3 mg/l for D007 nonwastewaters. The bulk of these data did not meet EPA criteria for proper evaluation, i.e., 1) lack of paired influent and effluent concentrations particularily untreated TCLP for corresponding treated TCLP concentrations; most of the commenters failed to provide untreated TCLP concentrations 2) no Quality Assurance/Quality Control (QA/QC) data and 3) lack of design and operations information for their treatment system.

COMMENT NUMBER: 8-A-25 (Continued)
DOCKET NUMBER: LD12-00270
COMMENTER: Eticam
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

Therefore, the Agency rejected much of the data for consideration of a standard. The data evaluated to determine 4.3 mg/l treatment level represents only a small fraction of the total data received on treatment of D007 wastes. Details on assessment of these data are presented in the Final Best Demonstrated Available Background Document (BDAT) for Chromium Wastes D007 and U032.

However, these data did suggest much variability in treatment for D007 nonwastewaters. The commenter remarked that as treaters of chrome wastes, they have observed that some chrome waste, particularly those mixed with other plating wastes containing complexing agents, are difficult to achieve the 5.2 mg/l from the F006 standard in some instances. EPA notes that this member of the treatment industry does not believe that treatment of D007 nonwastewater even to the characteristic level is generally achievable. Many commenters expressed concerns that due the fact that D007 waste matrices are so diverse (i.e., high total chromium concentrations, higher percentage of hexavalent chromium and the presence of complexing agents in some D007 waste streams), the diversity will prevent them from routinely achieving the proposed standard. The commenter suggested that even the alternate 5.2 mg/l standard from treatment of F006 waste may not be achievable for some D007 waste matrices.

Although the data available to EPA show that a treatment standard of 4.3 mg/l is achievable for D007 nonwastewaters, EPA recognizes the diversity of wastes that qualify as hazardous under the D007

COMMENT NUMBER: 8-A-25 (Continued)
DOCKET NUMBER: LD12-00270
COMMENTER: Eticam
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

classification. Because of this diversity EPA has chosen to regulate D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate. EPA believes even the most difficult to treat D007 waste with the exception of wastes in the inorganic solids debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule), can be treated to this level.

Comment Number: 8-A-26
Docket Number: LD10 - 00033
Commenter: AMERICAN IRON AND STEEL INSTITUTE
Issue: 8 - Chromium (D007)
Subissue: TREATMENT STANDARDS
Comment:

ii. EP Toxic Wastes - D007 Chromium. In its discussion of EP Toxic Wastes, EPA combines arsenic, chromium and selenium and distinguishes between these three metallic elements and other metallic constituents of wastes. AISI would stress that chromium is a constituent of wastes from the steel industry, particularly the specialty steel industry, and chromium in these wastes is not commonly associated with arsenic or selenium. These steel industry wastes have little in common with the wastes discussed in the regulatory preamble which are primarily aqueous wastes and may contain both arsenic and chromium. Steel industry wastes containing chromium would more closely resemble K061 Electric Arc Furnace Dust. In connection with the rulemaking on the first third scheduled wastes, AISI has submitted to the agency extensive data demonstrating that conventional stabilization adequately controls chromium to extremely low levels in chromium-containing hazardous waste K061. Based on this demonstrated performance, EPA has classified stabilization as BDAT for K061 wastes (containing less than 15% zinc) at 40 CFR 268.41. AISI believes that this same performance could be achieved on other steel industry wastes which may in the future be characterized as hazardous wastes. Therefore, AISI recommends that EPA give full consideration to conventional stabilization technology and capacity in the development of pretreatment regulations for D007 wastes.

COMMENT NUMBER: 8-A-26
DOCKET NUMBER: LD10-00033
COMMENTER: American Iron and Steel Institute
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Standards
RESPONSE

For the final rulemaking the Agency is promulgating concentration-based treatment standards for D007 nonwastewaters at the characteristic level of 5.0 mg/l in the TCLP leachate; and 5.0 mg/l total concentration for D007 wastewaters. In determing the treatment standards, the Agency reviewed all the D007 comments and performance data submitted during the comment period. As a result (including conventional stabilization data) of this review, the Agency withdrew the proposed treatment standards for D007. EPA determined that the proposed standard of 0.094 mg/l for nonwastewaters may not be routinely achievable for all D007 waste matrices. Based on the data submitted, the Agency determined that a standard of 0.74 mg/l may be more routeinely achievable for D007 matrices. Details on EPA's assessment of these data and calculation of a resultant treatment standard from these data are discussed in the Final BDAT Background Document for Chromium Wastes D007 and U032 Wastes.

Comment Number: 8-B-1
Docket Number: LD12-00050
Commenter: HAZARDOUS WASTE TREATMENT COUNCIL (HWTC)
Issue: 8-Chromium (D007)
Subissue: Treatment Data
Comment:

Gentlemen:

The Hazardous Waste Treatment Council (HWTC) submits the attached data concerning the treatability of a number of wastes identified in the proposed Third-Third regulation (54 FR 48372, November 22, 1989).

A member company of HWTC performs stabilization of hazardous wastes prior to land disposal of those wastes. An extensive testing program was conducted by this member company to determine suitability of stabilization when applied to a number of wastes containing metals constituents.

Data is submitted which reflects the results of this program. Additionally, a report of both raw and treated leachate is also included

I. INTRODUCTION

A series of investigations were undertaken to determine the suitability of BDAT standards proposed in the Third-Third rule in the November 22, 1989 Federal Register (54 FR 48372). This report presents those results.

A series of attachments which contain analytical data are included in this report. Each data set is identified by a load number. Table I presents the descriptions of the wastes for each load number as well as the parameters which were contained in the waste in significant quantities.

II. DISCUSSION OF QUALITY ASSURANCE

Samples of selected wastes were stabilized using proprietary reagents. These reagents are used to induce cementitious, siliceous and pozzolanic stabilization reactions. Solid wastes were first slurried with tap water to facilitate reaction with the reagents. Stabilized wastes are allowed to cure at least twenty-four hours prior to the TCLP extraction method (40 CFR 268, Appendix I).

One sample was duplicated and one extractor was filled only with extraction fluid (i.e. method blank) for each batch of twenty extractions . Filtered extracts were prepared for analysis using Method 3005. High purity acids were used in each preparation. Type II water was used for dilution.

Comment Number: 8-B-1 (continued)
Docket Number: LD12-00050
Commenter: HAZARDOUS WASTE TREATMENT COUNCIL
Issue: 8 - Chromium (D007)
Subissue: Treatment Data
Comment:

Samples were analyzed using Method 6010, Inductively Coupled Argon Plasma Spectrometry (ICP). The ICP unit was calibrated using four points. Calibration was verified by reading a mid-level standard as a sample. Tolerance limits were ± 10 percent. A calibration blank was read as a sample and a digested quality control sample was analyzed. Acceptance limits for the QC samples were also ± 10 per cent.

Samples were then analyzed. One in every twenty samples was duplicated and spiked. Generally, duplicates were within 10 to 15 per cent difference. Spiked samples were recovered at 85 to 115 percent.

Method detection limits were measured and quantitated at the 99% confidence limit. Depending upon the individual sample, one of the following sets of method detection limits applies:

Element	Lab A	Lab B
Arsenic	0.112	0.100
Barium	0.010	0.010
Cadmium	0.009	0.010
Chromium	0.052	0.010
Lead	0.066	0.100
Mercury	0.0005	0.0005
Nickel	0.037	0.010
Selenium	0.154	0.100
Silver	0.014	0.010
Thallium	0.070	0.100

Note: all units are in mg/l

All QA/QC information is maintained and is available upon request.

Comment Number: 8-B-1 (Continued)
Docket Number: LD12-00050
Commenter: HWTC
Issue: 8 - Chromium (D007)
Subissue: Treatment Data
Comment:

IX. Chromium

The data base was sorted for those values of chromium in the raw waste which were in excess of 35 mg/kg. This data is presented in Attachment G. Other data points indicating stabilization of chromium are found in Attachment H which present data on F019 waste.

XI. TCLP Performed on Untreated Waste

Appendix I contains data from TCLP analyses on untreated waste. This data has been compared with the total concentration of metal and the stabilized TCLP values in order to determine if stabilization reduces actual mobility of the waste constituents. This data is summarized in Table II.

Comment Number: 8-B-1 (continued)
Docket Number: LD12-00050
Commenter: HWTC
Issue: 8-Chromium (D007)
Subissue: Treatment Data
Comment:

TABLE I

WASTE DESCRIPTIONS

Load #	Parameters	Waste Description
6377	As, Ni, Cr	petroleum refinery waste containing between 10 and 20 % monoethylamine and the remainder being water
4473	Cr	mixed corrosive liquids
3734	Cr	waste acid from galvanizing solution
4469	Cr	alkaline liquid from the aluminum etch process
5035	Cr	waste hydrofluoric acid from semi-conductor manufacturing
3696	Cr	deoxidizer from metal finishing in the aerospace industry
4488	Ni, Cr	tank bottom sludges from a commercial hazardous waste treatment facility
6368K	Ni, Cr,	bleach from the neutralization for a cadmium plating line in the aerospace industry
6368D	Hg, Cr	waste isocyanate curing solution

Comment Number: 8B-1 (con't)
Docket Number: LD12-00050
Commenter: HWTC
Issue: 8- Chromium (D007)
Subissue: Treatment Data
Comment:

4602	Ni, Cr	chromic anodize solution from surface finishing in the aerospace industry
5404B	Ni, Cr	mixed metal chips from machining operations in the aerospace industry
4497B	Ni, Ba, Cr	sodium flouride/metal sludge from the metal forming and waste water treatment plant plant in the aerospace industry
6372I	Ni, Ba, Pb Cr	zinc ammonium chloride solids from the manufacturing of containers
4467B	Ba, Pb, Cr	incinerator flyash from the aerospace industry
3889	Pb, Cr	sump sludge from reconditioning of metal drums
5029A	Pb, Cr	ammonium hydroxide waste from electroplating
6346 6319	Pb, Cr	water filtration sludge from the manufacture of conduit piping
4457	Cr	mixed acid solution from the aerospace industry
3814K	Cr	spent acid from the aerospace industry
4465	Cr	coolant and washwater from machining operations

Comment Number: 8-B-1 (Cont)
Docket Number: LD12-00050
Commenter: HWTC
Issue: 8-Chromium (D007)
Subissue: Treatment Data
Comment:

TABLE II

RELATIONSHIP BETWEEN TOTAL CONCENTRATION, UNTREATED TCLP AND STABILIZED TCLP OF SELECTED WASTES

Load	Element	untrtd Tot (mg/kg)	untrtd TCLP (mg/l)	trtd TCLP (mg/l)
4342	Pb	29	6.01	0.1
6257	Ba	580	2.41	1.42
			2.38	1.01
4497B	Ba	68.5	1.98	1.46
	Cr	1660	1.66	0.12
	Ni	55.6	3.52	0.01
4467B	Ba	158	1.09	0.859
	Pb	810	0.749	0.273
	Cr	48.7	0.096	0.061
5404	Cr	3100	4.42	0.01
	Ni	128	2.21	0.01
	Th	236	0.409	0.1
6316A	Ni	4760	65.3	0.06
6243	Ba	1390	353	12.32
4322	As	23.6	2.26	0.112
			4.65	
	Ba	104	0.481	0.246
	Pb	130	1.27	0.083
	Ni	3960	108	5.31
			216	
	Se	5	2.97	0.154
6319	Cr	454	0.106	0.06
	Pb	36	0.515	0.1
6377	As	602	409	0.329

LD12-00050.G
8-B-1 (Cont)

ATTACHMENT G

DATA CONCERNING CHROMIUM

LD 12-00050

8-B-1

TCLP Number 10-27-89-D08 Load Number 4457

[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	0.5	0.85
3	Cadmium	0.5	0.01
4	Chromium	15800	4.54
5	Lead	5	0.1
6	Mercury	0.07	0.0005
7	Nickel	0.5	0.01
8	Selenium	5	0.1
9	Silver	0.5	0.01
10	Thallium	5	0.1

Waste Mass 50

Comp 1 Mass 95.3 Component 1 [redacted]

Comp 2 Mass 2 Component 2 [redacted]

Comp 3 Mass 5 Component 3 [redacted]

Comp 4 Mass 258 Component 4 [redacted]

Final Volume 220 Initial Volume 30 Volume Increase 7.333

TCLP Number 11-21-89-D12 Load Number 4457

[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.239
2	Barium	0.5	0.463
3	Cadmium	0.5	0.009
4	Chromium	15800	65.8
5	Lead	5	0.104
6	Mercury	0.07	0.0002
7	Nickel	0.5	0.068
8	Selenium	5	0.154
9	Silver	0.5	0.014
10	Thallium	5	0.12

Waste Mass 100

Comp 1 Mass 1 Component 1 [redacted]

Comp 2 Mass 120 Component 2 [redacted]

Comp 3 Mass 30 Component 3 [redacted]

Comp 4 Mass Component 4

Final Volume 350 Initial Volume 100 Volume Increase 3.5

LDR-00050
8-B-1 (Cont)

TCLP Number 11-08-89-D16 Load Number 3814K
[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.1
2	Barium	0.01	0.83
3	Cadmium	0.01	0.01
4	Chromium	5060	1.38
5	Lead	0.9	0.1
6	Mercury	0.055	0.0005
7	Nickel	0.19	0.01
8	Selenium	0.1	0.1
9	Silver	0.01	0.01
10	Thallium	0.1	0.1

Waste Mass	100	Comp 1 Mass 20	Component 1 [redacted]
		Comp 2 Mass 4	Component 2 [redacted]
		Comp 3 Mass 10	Component 3 [redacted]
		Comp 4 Mass 150	Component 4 [redacted]

Final Volume 150 Initial Volume 100 Volume Increase 1.5

TCLP Number 11-28-89-D02 Load Number 3814K
[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.84
2	Barium	0.01	1.26
3	Cadmium	0.01	0.031
4	Chromium	5060	182
5	Lead	0.9	0.321
6	Mercury	0.055	0.0002
7	Nickel	0.19	0.384
8	Selenium	0.1	0.402
9	Silver	0.01	1.04
10	Thallium	0.1	0.531

Waste Mass	101.3	Comp 1 Mass 1.01	Component 1 [redacted]
		Comp 2 Mass 115.1	Component 2 [redacted]
		Comp 3 Mass 28.74	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 200 Initial Volume 100 Volume Increase 2

LD12-00050
8-B-1 (Cont)

TCLP Number 10-27-89-D17 Load Number 4465
[redacted] Waste Code 1 D007 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	1	0.1
2	Barium	0.1	1.56
3	Cadmium	0.1	0.01
4	Chromium	3170	0.08
5	Lead	1	0.1
6	Mercury	0.01	0.0005
7	Nickel	0.1	0.01
8	Selenium	1	0.1
9	Silver	0.1	0.01
10	Thallium	1	0.1

Waste		Comp 1 Mass 4	Component 1 [redacted]
Mass	100	Comp 2 Mass 10	Component 2 [redacted]
		Comp 3 Mass 266	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 200 Initial Volume 100 Volume Increase 2

TCLP Number 11-21-89-D25 Load Number 4465
[redacted] Waste Code 1 D007 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	1	0.112
2	Barium	0.1	0.467
3	Cadmium	0.1	0.009
4	Chromium	3170	0.052
5	Lead	1	0.066
6	Mercury	0.01	
7	Nickel	0.1	0.037
8	Selenium	1	0.154
9	Silver	0.1	0.014
10	Thallium	1	0.07

Waste		Comp 1 Mass 1	Component 1 [redacted]
Mass	100	Comp 2 Mass 120	Component 2 [redacted]
		Comp 3 Mass 30	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 250 Initial Volume 100 Volume Increase 2.5

LD12-00050
2-B-1 (Cont)

TCLF Number 10-27-89-D20 Load Number 5404B
[redacted] Waste Code 1 D007 2 D008 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	0.5	1.41
3	Cadmium	0.5	0.01
4	Chromium	3100	0.01
5	Lead	5	0.1
6	Mercury	0.01	0.0005
7	Nickel	128	0.01
8	Selenium	5	0.1
9	Silver	0.5	0.01
10	Thallium	236	0.1

Waste		Comp 1 Mass 100	Component 1 [redacted]
Mass	100	Comp 2 Mass 4	Component 2 K[redacted]
		Comp 3 Mass 10	Component 3 S[redacted]
		Comp 4 Mass 221	Component 4 T[redacted]

Final Volume 200 Initial Volume 100 Volume Increase 2

TCLP Number 11-27-89-D13 Load Number 5404B
[redacted] Waste Code 1 D007 2 D008 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.112
2	Barium	0.5	0.933
3	Cadmium	0.5	0.009
4	Chromium	3100	0.094
5	Lead	5	0.125
6	Mercury	0.01	0.0002
7	Nickel	128	0.194
8	Selenium	5	0.154
9	Silver	0.5	0.014
10	Thallium	236	0.077

Waste		Comp 1 Mass 100.1	Component 1 W[redacted]
Mass	102.3	Comp 2 Mass 1.01	Component 2 K[redacted]
		Comp 3 Mass 159.9	Component 3 R[redacted]
		Comp 4 Mass 39.98	Component 4 T[redacted]

Final Volume 280 Initial Volume 100 Volume Increase 2.8

LD12-00050
8-B-1 (Cont)

TCLP Number 10-31-89-D06 Load Number 4497B

[redacted] Waste Code 1 D007 2 D008 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	68.5	1.46
3	Cadmium	0.5	0.01
4	Chromium	1660	0.12
5	Lead	5	0.1
6	Mercury	0.01	0.0005
7	Nickel	55.6	0.01
8	Selenium	5	0.1
9	Silver	0.5	0.01
10	Thallium	5	0.1

Waste		Comp 1 Mass 100	Component 1 [redacted]
Mass	100	Comp 2 Mass 4	Component 2 [redacted]
		Comp 3 Mass 10	Component 3 [redacted]
		Comp 4 Mass 180	Component 4 [redacted]

Final Volume 260 Initial Volume 100 Volume Increase 2.6

TCLP Number 11-21-89-D27 Load Number 4497B

[redacted] Waste Code 1 D007 2 D008 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.113
2	Barium	68.5	0.416
3	Cadmium	0.5	0.009
4	Chromium	1660	0.081
5	Lead	5	0.066
6	Mercury	0.01	0.0002
7	Nickel	55.6	0.037
8	Selenium	5	0.154
9	Silver	0.5	0.014
10	Thallium	5	0.07

Waste		Comp 1 Mass 100	Component 1 [redacted]
Mass	100	Comp 2 Mass 1	Component 2 [redacted]
		Comp 3 Mass 120	Component 3 [redacted]
		Comp 4 Mass 30	Component 4 [redacted]

Final Volume 180 Initial Volume 100 Volume Increase 1.8

LD12-00050
8-B-1(Cont)

TCLP Number 11-21-89-D19 Load Number 6368K

[redacted] Waste Code 1 D007 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.112
2	Barium	0.01	0.509
3	Cadmium	91.2	0.009
4	Chromium	1350	1.36
5	Lead	0.1	0.066
6	Mercury	0.0005	0.0002
7	Nickel	720	0.037
8	Selenium	0.1	0.154
9	Silver	0.01	0.014
10	Thallium	0.1	0.07

Waste		Comp 1 Mass 1	Component 1 [redacted]
Mass	100	Comp 2 Mass 120	Component 2 [redacted]
		Comp 3 Mass 30	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 300 Initial Volume 120 Volume Increase 2.5

TCLP Number 11-10-89-D08 Load Number 6368K

[redacted] Waste Code 1 D007 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.1
2	Barium	0.01	0.94
3	Cadmium	91.2	0.01
4	Chromium	1350	0.08
5	Lead	0.1	0.1
6	Mercury	0.0005	0.0005
7	Nickel	720	0.01
8	Selenium	0.1	0.1
9	Silver	0.01	0.01
10	Thallium	0.1	0.1

Waste		Comp 1 Mass 2.5	Component 1 [redacted]
Mass	100	Comp 2 Mass 4	Component 2 [redacted]
		Comp 3 Mass 10	Component 3 [redacted]
		Comp 4 Mass 200	Component 4 [redacted]

Final Volume 160 Initial Volume 100 Volume Increase 1.6

LD12-00050
8-B-1 (Cont)

TCLP Number 11-21-89-D17 Load Number 6368K
[redacted] Waste Code 1 D007 2 D008 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.12
2	Barium	0.01	0.691
3	Cadmium	91.2	0.009
4	Chromium	1350	0.052
5	Lead	0.1	0.066
6	Mercury	0.0005	0.0002
7	Nickel	720	0.037
8	Selenium	0.1	0.154
9	Silver	0.01	0.014
10	Thallium	0.1	0.07

Waste		Comp 1 Mass	100	Component 1	[redacted]
Mass	100	Comp 2 Mass	1	Component 2	[redacted]
		Comp 3 Mass	120	Component 3	[redacted]
		Comp 4 Mass	30	Component 4	[redacted]

Final Volume 400 Initial Volume 100 Volume Increase 4

TCLP Number 11-27-89-D26 Load Number 6346
[redacted] Waste Code 1 D007 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.14
2	Barium	7	0.631
3	Cadmium	1.2	0.009
4	Chromium	904	0.052
5	Lead	234	0.092
6	Mercury	0.01	0.0002
7	Nickel	23.3	0.037
8	Selenium	5	0.158
9	Silver	0.5	0.014
10	Thallium	5	0.07

Waste		Comp 1 Mass	100.1	Component 1	[redacted]
Mass	100.8	Comp 2 Mass	1.03	Component 2	[redacted]
		Comp 3 Mass	225.8	Component 3	[redacted]
		Comp 4 Mass	56.43	Component 4	[redacted]

Final Volume 350 Initial Volume 100 Volume Increase 3.5

LD12-00050
8-B-1 (Cont)

TCLP Number 11-06-89-D14 Load Number 6346

[redacted] Waste Code 1 D007 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	7	0.89
3	Cadmium	1.2	0.01
4	Chromium	904	0.06
5	Lead	234	0.1
6	Mercury	0.01	0.0005
7	Nickel	23.3	0.01
8	Selenium	5	0.1
9	Silver	0.5	0.01
10	Thallium	5	0.1

Waste		Comp 1 Mass 100	Component 1 [redacted]
Mass	100	Comp 2 Mass 4	Component 2 [redacted]
		Comp 3 Mass 10	Component 3 [redacted]
		Comp 4 Mass 182	Component 4 [redacted]

Final Volume 240 Initial Volume 90 Volume Increase 2.666

TCLP Number 10-30-89-D02 Load Number 4488

[redacted] Waste Code 1 D006 2 D007 3 D008 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	0.5	1.07
3	Cadmium	0.5	0.01
4	Chromium	806	0.08
5	Lead	5	0.01
6	Mercury	0.078	0.1
7	Nickel	2400	0.0005
8	Selenium	5	0.01
9	Silver	0.5	0.1
10	Thallium	5	0.01

Waste		Comp 1 Mass 4	Component 1 [redacted]
Mass	100	Comp 2 Mass 10	Component 2 [redacted]
		Comp 3 Mass 266	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 220 Initial Volume 140 Volume Increase 1.571

LDR-00050
8-B-1 (Cont)

TCLP Number 11-06-89-D12 Load Number 6319

[redacted] Waste Code 1 D007 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	4	1.04
3	Cadmium	0.5	0.01
4	Chromium	454	0.06
5	Lead	36	0.1
6	Mercury	0.1	0.0005
7	Nickel	10.5	0.01
8	Selenium	5	0.1
9	Silver	0.5	0.01
10	Thallium	5	0.1

Waste Mass	100	Comp 1 Mass 100	Component 1 [redacted]
		Comp 2 Mass 4	Component 2 [redacted]
		Comp 3 Mass 10	Component 3 [redacted]
		Comp 4 Mass 183	Component 4 [redacted]

Final Volume 250 Initial Volume 90 Volume Increase 2.777

TCLP Number 11-27-89-D24 Load Number 6319

[redacted] Waste Code 1 D007 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.181
2	Barium	4	1.34
3	Chromium	0.5	0.009
4	Lead	454	0.111
5	Mercury	36	0.145
6	Mercury	0.1	0.0002
7	Nickel	10.5	0.037
8	Selenium	5	0.186
9	Silver	0.5	0.014
10	Thallium	5	0.102

Waste Mass	99.11	Comp 1 Mass 100.1	Component 1 [redacted]
		Comp 2 Mass 1.07	Component 2 [redacted]
		Comp 3 Mass 203.9	Component 3 [redacted]
		Comp 4 Mass 50.98	Component 4 [redacted]

Final Volume 380 Initial Volume 100 Volume Increase 3.8

LD12-00050
8-B-1 (Cont)

TCLP Number 11-10-89-D09 Load Number 6368D

[redacted] Waste Code 1 D005 2 D007 3 D008 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.1
2	Barium	5.21	1.27
3	Cadmium	0.01	0.01
4	Chromium	260	0.06
5	Lead	0.1	0.1
6	Mercury	3.4	0.0005
7	Nickel	0.68	0.01
8	Selenium	0.1	0.1
9	Silver	0.01	0.01
10	Thallium	0.1	0.1

Waste Mass	100	Comp 1 Mass 100	Component 1 [redacted]
		Comp 2 Mass 4	Component 2 [redacted]
		Comp 3 Mass 10	Component 3 [redacted]
		Comp 4 Mass 200	Component 4 [redacted]

Final Volume 160 Initial Volume 100 Volume Increase 1.6

TCLP Number 11-21-89-D18 Load Number 6368D

[redacted] Waste Code 1 D005 2 D007 3 D008 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.143
2	Barium	5.21	0.532
3	Cadmium	0.01	0.009
4	Chromium	260	0.183
5	Lead	0.1	0.066
6	Mercury	3.4	0.0002
7	Nickel	0.68	0.037
8	Selenium	0.1	0.154
9	Silver	0.01	0.014
10	Thallium	0.1	0.08

Waste Mass	100	Comp 1 Mass 100	Component 1 [redacted]
		Comp 2 Mass 1	Component 2 [redacted]
		Comp 3 Mass 120	Component 3 [redacted]
		Comp 4 Mass 30	Component 4 [redacted]

Final Volume 300 Initial Volume 120 Volume Increase 2.5

LDR-00050
8-B-1 (Cont)

TCLP Number 10-27-89-D06 Load Number 4469

[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	2.5	0.65
3	Cadmium	0.5	0.01
4	Chromium	216	0.01
5	Lead	5	0.1
6	Mercury	0.01	0.0005
7	Nickel	0.5	0.01
8	Selenium	5	0.1
9	Silver	0.5	0.01
10	Thallium	5	0.1

Waste		Comp 1 Mass 4	Component 1 [redacted]
Mass	100	Comp 2 Mass 10	Component 2 [redacted]
		Comp 3 Mass 161	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 120 Initial Volume 70 Volume Increase 1.714

TCLP Number 11-21-89-D09 Load Number 4469

[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.315
2	Barium	2.5	0.297
3	Cadmium	0.5	0.013
4	Chromium	216	0.052
5	Lead	5	0.083
6	Mercury	0.01	0.0009
7	Nickel	0.5	0.037
8	Selenium	5	0.154
9	Silver	0.5	0.014
10	Thallium	5	0.07

Waste		Comp 1 Mass 1	Component 1 [redacted]
Mass	100	Comp 2 Mass 120	Component 2 [redacted]
		Comp 3 Mass 30	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 320 Initial Volume 100 Volume Increase 3.2

LD12-00050
8-B-1 (Cont)

TCLP Number 10-27-89-D10 Load Number 5035

[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	1	0.1
2	Barium	0.9	0.92
3	Cadmium	0.1	0.01
4	Chromium	190	0.26
5	Lead	1	0.1
6	Mercury	0.01	0.0005
7	Nickel	0.1	0.01
8	Selenium	1	0.1
9	Silver	0.1	0.01
10	Thallium	1	0.1

Waste		Comp 1 Mass 36.7	Component 1 R[redacted]
Mass	50	Comp 2 Mass 2	Component 2 K[redacted]
		Comp 3 Mass 5	Component 3 S[redacted]e
		Comp 4 Mass 178	Component 4 T[redacted]

Final Volume 140 Initial Volume 40 Volume Increase 3.5

TCLP Number 11-21-89-D13 Load Number 5035

[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	1	0.119
2	Barium	0.9	0.808
3	Cadmium	0.1	0.009
4	Chromium	190	0.821
5	Lead	1	0.088
6	Mercury	0.01	0.0002
7	Nickel	0.1	0.037
8	Selenium	1	0.154
9	Silver	0.1	0.014
10	Thallium	1	0.08

Waste		Comp 1 Mass 1	Component 1 K[redacted]
Mass	100	Comp 2 Mass 120	Component 2 R[redacted]
		Comp 3 Mass 30	Component 3 T[redacted]
		Comp 4 Mass	Component 4

Final Volume 350 Initial Volume 100 Volume Increase 3.5

LD12-00050
8-8-1 (Cont)

TCLP Number 11-10-89-D12   Load Number 6372I

[redacted]   Waste Code 1 D004   2 D006   3 D007   4 D008

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	69	1.62
3	Cadmium	31.4	0.01
4	Chromium	142	0.01
5	Lead	49100	8.7
6	Mercury	0.1	0.0005
7	Nickel	48.6	0.01
8	Selenium	5	0.1
9	Silver	0.5	0.01
10	Thallium	5	0.1

Waste	Comp 1 Mass 100	Component 1	[redacted]
Mass 100	Comp 2 Mass 4	Component 2	[redacted]
	Comp 3 Mass 10	Component 3	[redacted]
	Comp 4 Mass 200	Component 4	[redacted]

Final Volume 180   Initial Volume 100   Volume Increase 1.8

TCLP Number 11-21-89-D16   Load Number 6372I

[redacted]   Waste Code 1 D004   2 D006   3 D007   4 D811

#	Metal	Total	Stabilized
1	Arsenic	5	0.365
2	Barium	69	1.01
3	Cadmium	31.4	0.188
4	Chromium	142	0.052
5	Lead	49100	6.41
6	Mercury	0.1	0.0002
7	Nickel	48.6	0.062
8	Selenium	5	0.36
9	Silver	0.5	0.014
10	Thallium	5	0.256

Waste	Comp 1 Mass 100	Component 1	[redacted]
Mass 100	Comp 2 Mass 1	Component 2	[redacted]
	Comp 3 Mass 120	Component 3	[redacted]
	Comp 4 Mass 30	Component 4	[redacted]

Final Volume 180   Initial Volume 70   Volume Increase 2.571

TCLP Number 11-28-89-D10 Load Number 4602

LD12-00050
8-B-1 (Cont)

[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.247
2	Barium	0.17	1.36
3	Cadmium	0.08	0.009
4	Chromium	135	0.085
5	Lead	1.6	0.235
6	Mercury	0.0075	0.0002
7	Nickel	256	0.6
8	Selenium	0.1	0.193
9	Silver	0.32	0.014
10	Thallium	0.1	0.142

Waste		Comp 1 Mass	1.01	Component 1	[redacted]
Mass	102.9	Comp 2 Mass	259	Component 2	[redacted]
		Comp 3 Mass	65	Component 3	[redacted]
		Comp 4 Mass		Component 4	

Final Volume 360 Initial Volume 100 Volume Increase 3.6

TCLP Number 11-08-89-D05 Load Number 4602

[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.1
2	Barium	0.17	1.44
3	Cadmium	0.08	0.01
4	Chromium	135	0.07
5	Lead	1.6	0.1
6	Mercury	0.0075	0.0005
7	Nickel	256	0.01
8	Selenium	0.1	0.1
9	Silver	0.32	0.01
10	Thallium	0.1	0.1

Waste		Comp 1 Mass	5	Component 1	[redacted]
Mass	100	Comp 2 Mass	4	Component 2	[redacted]
		Comp 3 Mass	10	Component 3	[redacted]
		Comp 4 Mass	200	Component 4	[redacted]

Final Volume 160 Initial Volume 100 Volume Increase 1.6

LD12-00050
8-B-1 (Cont)

TCLP Number 10-30-89-D01 Load Number 3889

[redacted] Waste Code 1 D008 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	9.5	0.73
3	Cadmium	1.45	0.01
4	Chromium	68.6	0.08
5	Lead	460	0.1
6	Mercury	0.01	0.0005
7	Nickel	15	0.15
8	Selenium	5	0.1
9	Silver	0.5	0.01
10	Thallium	5	0.1

Waste Mass	100	Comp 1 Mass 4	Component 1 K[redacted]
		Comp 2 Mass 10	Component 2 S[redacted]
		Comp 3 Mass 307	Component 3 T[redacted]
		Comp 4 Mass	Component 4

Final Volume 220 Initial Volume 90 Volume Increase 2.444

TCLP Number 11-21-89-D22 Load Number 3889

[redacted] Waste Code 1 D008 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.112
2	Barium	9.5	0.271
3	Cadmium	1.45	0.009
4	Chromium	68.6	0.052
5	Lead	460	0.066
6	Mercury	0.01	0.0002
7	Nickel	15	0.037
8	Selenium	5	0.154
9	Silver	0.5	0.014
10	Thallium	5	0.07

Waste Mass	100	Comp 1 Mass 1	Component 1 K[redacted]
		Comp 2 Mass 120	Component 2 R[redacted]
		Comp 3 Mass 30	Component 3 T[redacted]
		Comp 4 Mass	Component 4

Final Volume 220 Initial Volume 100 Volume Increase 2.2

LD12-00050
8-B-1 (Cont)

TCLP Number 11-08-89-D15 Load Number 3696
[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.1
2	Barium	0.3	0.94
3	Cadmium	0.01	0.01
4	Chromium	67.7	0.1
5	Lead	0.1	0.1
6	Mercury	0.0005	0.0005
7	Nickel	0.01	0.01
8	Selenium	0.1	0.1
9	Silver	0.01	0.01
10	Thallium	0.1	0.1

Waste Mass	100	Comp 1 Mass 9.5	Component 1 [redacted]
		Comp 2 Mass 4	Component 2 [redacted]
		Comp 3 Mass 10	Component 3 [redacted]
		Comp 4 Mass 220	Component 4 [redacted]

Final Volume 180 Initial Volume 100 Volume Increase 1.8

TCLP Number 11-28-89-D07 Load Number 3696
[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.248
2	Barium	0.3	1.29
3	Cadmium	0.01	0.009
4	Chromium	67.7	0.421
5	Lead	0.1	0.256
6	Mercury	0.0005	0.0002
7	Nickel	0.01	0.163
8	Selenium	0.1	0.199
9	Silver	0.01	0.014
10	Thallium	0.1	0.07

Waste Mass	100.1	Comp 1 Mass 1.04	Component 1 [redacted]
		Comp 2 Mass 186	Component 2 [redacted]
		Comp 3 Mass 47	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 380 Initial Volume 100 Volume Increase 3.8

LD12-00050
8-B-1 (Cont)

TCLP Number 11-27-89-D17 Load Number 6377

[redacted] Waste Code 1 D004 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	602	0.329
2	Barium	0.2	0.67
3	Cadmium	0.2	0.009
4	Chromium	66.5	0.1
5	Lead	2	0.066
6	Mercury	0.0005	0.0002
7	Nickel	66.7	0.269
8	Selenium	2	0.154
9	Silver	0.2	0.014
10	Thallium	2	0.07

Waste		Comp 1 Mass 1.01	Component 1 [redacted]
Mass	100.1	Comp 2 Mass 217.5	Component 2 [redacted]
		Comp 3 Mass 54.36	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 300 Initial Volume 100 Volume Increase 3

TCLP Number 11-08-89-D02 Load Number 6377

[redacted] Waste Code 1 D004 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	602	0.1
2	Barium	0.2	1.14
3	Cadmium	0.2	0.01
4	Chromium	66.5	0.22
5	Lead	2	0.1
6	Mercury	0.0005	0.0005
7	Nickel	66.7	0.62
8	Selenium	2	0.01
9	Silver	0.2	0.01
10	Thallium	2	0.1

Waste		Comp 1 Mass 4	Component 1 [redacted]
Mass	100	Comp 2 Mass 10	Component 2 [redacted]
		Comp 3 Mass 260	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 150 Initial Volume 100 Volume Increase 1.5

LD 12 -00050
8-B-1 (Cont)

TCLP Number 11-27-89-D20 Load Number 4473

[redacted] Waste Code 1 D006 2 D007 3 D008 4

#	Metal	Total	Stabilized
1	Arsenic	1	0.114
2	Barium	0.1	0.825
3	Cadmium	0.1	0.009
4	Chromium	56.2	0.311
5	Lead	1	0.066
6	Mercury	0.01	0.0002
7	Nickel	1.3	0.037
8	Selenium	1	0.154
9	Silver	0.1	0.014
10	Thallium	1	0.14

Waste		Comp 1 Mass	1.03	Component 1	K[redacted]
Mass	100.1	Comp 2 Mass	203.3	Component 2	R[redacted]
		Comp 3 Mass	50.85	Component 3	T[redacted]
		Comp 4 Mass		Component 4	

Final Volume 300 Initial Volume 100 Volume Increase 3

TCLP Number 10-27-89-D14 Load Number 4473

[redacted] Waste Code 1 D006 2 D007 3 D008 4

#	Metal	Total	Stabilized
1	Arsenic	1	0.1
2	Barium	0.1	0.81
3	Cadmium	0.1	0.01
4	Chromium	56.2	0.1
5	Lead	1	0.1
6	Mercury	0.01	0.0005
7	Nickel	1.3	0.01
8	Selenium	1	0.1
9	Silver	0.1	0.01
10	Thallium	1	0.1

Waste		Comp 1 Mass	4	Component 1	K[redacted]
Mass	100	Comp 2 Mass	10	Component 2	S[redacted]
		Comp 3 Mass	246	Component 3	T[redacted]
		Comp 4 Mass		Component 4	

Final Volume 200 Initial Volume 100 Volume Increase 2

LD 12-00150
8-B-1 (cont)

TCLP Number 11-27-89-D14 Load Number 4467B

[redacted] Waste Code 1 D006 2 D007 3 D008 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.257
2	Barium	158	0.859
3	Cadmium	167	1.7
4	Chromium	48.7	0.061
5	Lead	810	0.273
6	Mercury	0.05	0.0002
7	Nickel	0.5	0.089
8	Selenium	5	0.246
9	Silver	0.5	0.017
10	Thallium	5	0.128

Waste		Comp 1 Mass 100.9	Component 1 [redacted]
Mass	100.1	Comp 2 Mass 1.07	Component 2 [redacted]
		Comp 3 Mass 73.14	Component 3 [redacted]
		Comp 4 Mass 18.29	Component 4 [redacted]

Final Volume 280 Initial Volume 100 Volume Increase 2.8

TCLP Number 10-30-89-D04 Load Number 4467B

[redacted] Waste Code 1 D006 2 D007 3 D008 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	158	1.15
3	Cadmium	167	0.01
4	Chromium	48.7	0.06
5	Lead	810	0.1
6	Mercury	0.05	0.0005
7	Nickel	0.5	0.01
8	Selenium	5	0.1
9	Silver	0.5	0.01
10	Thallium	5	0.1

Waste		Comp 1 Mass 175	Component 1 [redacted]
Mass	100	Comp 2 Mass 4	Component 2 [redacted]
		Comp 3 Mass 10	Component 3 [redacted]
		Comp 4 Mass 115	Component 4 [redacted]

Final Volume 250 Initial Volume 280 Volume Increase 0.892

LD12-00050
8-B-1 (Cont)

TCLP Number 10-27-89-D18 Load Number 5029A

[redacted] Waste Code 1 D008 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.1
2	Barium	7	1.32
3	Cadmium	0.5	0.01
4	Chromium	38.8	0.06
5	Lead	450	0.1
6	Mercury	0.01	0.0024
7	Nickel	5.8	0.01
8	Selenium	5	0.1
9	Silver	26.2	0.01
10	Thallium	5	0.1

Waste		Comp 1 Mass 4	Component 1 [redacted]
Mass	100	Comp 2 Mass 10	Component 2 [redacted]
		Comp 3 Mass 217	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 160 Initial Volume 100 Volume Increase 1.6

TCLP Number 11-21-89-D15 Load Number 5029A

[redacted] Waste Code 1 D008 2 3 4

#	Metal	Total	Stabilized
1	Arsenic	5	0.112
2	Barium	7	0.677
3	Cadmium	0.5	0.019
4	Chromium	38.8	0.052
5	Lead	450	0.088
6	Mercury	0.01	0.0002
7	Nickel	5.8	0.037
8	Selenium	5	0.154
9	Silver	26.2	0.014
10	Thallium	5	0.094

Waste		Comp 1 Mass 1	Component 1 [redacted]
Mass	100	Comp 2 Mass 120	Component 2 [redacted]
		Comp 3 Mass 30	Component 3 [redacted]
		Comp 4 Mass	Component 4

Final Volume 250 Initial Volume 100 Volume Increase 2.5

LD12-00050
8-B-1 (Cont)

TCLP Number 11-08-89-D09 Load Number 3734

[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.1
2	Barium	0.05	1.35
3	Cadmium	0.01	0.01
4	Chromium	38.4	0.08
5	Lead	0.1	0.1
6	Mercury	0.0016	0.0005
7	Nickel	0.15	0.01
8	Selenium	0.1	0.1
9	Silver	0.11	0.01
10	Thallium	0.1	0.1

Waste Mass 100	Comp 1 Mass 4	Component 1 [redacted]
	Comp 2 Mass 10	Component 2 [redacted]
	Comp 3 Mass 200	Component 3 [redacted]
	Comp 4 Mass	Component 4

Final Volume 160 Initial Volume 100 Volume Increase 1.6

TCLP Number 11-27-89-D28 Load Number 3734

[redacted] Waste Code 1 D002 2 D007 3 4

#	Metal	Total	Stabilized
1	Arsenic	0.1	0.112
2	Barium	0.05	1.24
3	Cadmium	0.01	0.009
4	Chromium	38.4	0.166
5	Lead	0.1	0.123
6	Mercury	0.0016	0.0002
7	Nickel	0.15	0.229
8	Selenium	0.1	0.154
9	Silver	0.11	0.014
10	Thallium	0.1	0.07

Waste Mass 100	Comp 1 Mass 1	Component 1 [redacted]
	Comp 2 Mass 200	Component 2 [redacted]
	Comp 3 Mass 50	Component 3 [redacted]
	Comp 4 Mass	Component 4

Final Volume 0 Initial Volume 0 Volume Increase 0

LD12-00050-I

ATTACHMENT I

TCLP DATA FROM UNTREATED WASTES

TCLP Number 12-13-89-D06 Generator [redacted] Load Number 5044978I

[redacted] Waste Code 1 D007 2 D008 3 4

#	Metal	Total	Stabilized	% Efficiency
1	Arsenic	0.447		0
2	Barium	1.98		0
3	Cadmium	0.029		0
4	Chromium	1.66		0
5	Lead	0.232		0
6	Mercury			0
7	Nickel	3.52		0
8	Selenium	0.361		0
9	Silver	0.014		0
10	Thallium	0.305		0

% Solids S. G. pH
Normality Sniff Free Liquids

Page Down For More Input/Viewing

Waste Mass
Comp 1 Mass Component 1
Comp 2 Mass Component 2
Comp 3 Mass Component 3
Comp 4 Mass Component 4
Comp 5 Mass Component 5
Comp 6 Mass Component 6
Comp 7 Mass Component 7

Final Volume Initial Volume Volume Increase

8-B-1

74

50-I

```
TCLP Number 12-13-89-008 Generator [redacted]                    Load Number 41676
[redacted]            Waste Code 1 D006  2 D007  3 D006
  #    Metal                   Total                  Stabilized          % Efficien
  1    Arsenic                 0.884                                          0
  2    Barium                  1.09                                           0
  3    Cadmium                 8.79                                           0
  4    Chromium                0.096                                          0
  5    Lead                    0.749                                          0
  6    Mercury                                                                0
  7    Nickel                  0.222                                          0
  8    Selenium                0.86                                           0
  9    Silver                  0.014                                          0
 10    Thallium                0.372                                          0

% Solids                 S. G.                pH
Normality                Sniff                Free Liquids


                    Page Down For More Input/Viewing



Waste              Comp 1 Mass          Component 1
Mass               Comp 2 Mass          Component 2
                   Comp 3 Mass          Component 3
              Comp 4 Mass           Component 4
                   Comp 5 Mass          Component 5
                   Comp 6 Mass          Component 6
                   Comp 7 Mass          Component 7

Final Volume             Initial Volume             Volume Increase
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8-B-1

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TCLP Number 12-13-89-D09 Generator [redacted]                    Load Numb 50-I
[redacted]            Waste Code 1 D007  2 D008  3      4
  #       Metal                          Total                Stabilized      % Efficienc
  1       Arsenic                        0.581                                      0
  2       Barium                         1.12                                       0
  3       Cadmium                        0.037                                      0
  4       Chromium                       4.42                                       0
  5       Lead                           0.696                                      0
  6       Mercury                                                                   0
  7       Nickel                         2.21                                       0
  8       Selenium                       0.53                                       0
  9       Silver                         0.014                                      0
 10       Thallium                       0.409                                      0

% Solids                   S. G.                  pH
Normality                  Sniff                  Free Liquids


                           Page Down For More Input/Viewing




Waste              Comp 1 Mass          Component 1
Mass               Comp 2 Mass          Component 2
                   Comp 3 Mass          Component 3
               Comp 4 Mass          Component 4
                   Comp 5 Mass          Component 5
                   Comp 6 Mass          Component 6
                   Comp 7 Mass          Component 7

Final Volume              Initial Volume               Volume Increase
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8-B-1

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TCLP Number 12-[illegible]-89-015 Generator [redacted]          Load Number 6319
[redacted]   Waste Code 1 D007  2      3      4
 #        Metal                  Total                    Stabilized      % Efficien
 1        Arsenic                0.321                                       0
 2        Barium                 0.408                                       0
 3        Cadmium                0.22                                        0
 4        Chromium               0.106                                       0
 5        Lead                   0.315                                       0
 6        Mercury                                                            0
 7        Nickel                 0.591                                       0
 8        Selenium               1.05                                        0
 9        Silver                 0.014                                       0
10        Thallium               0.765

% Solids                   S. G.                 pH
Normality                  Sniff                 Free Liquids


                        Page Down For More Input/Viewing




Waste                Comp 1 Mass          Component 1
Mass                 Comp 2 Mass          Component 2
                     Comp 3 Mass          Component 3
                Comp 4 Mass          Component 4
                     Comp 5 Mass          Component 5
                     Comp 6 Mass          Component 6
                     Comp 7 Mass          Component 7

Final Volume               Initial Volume           Volume Increase  0
```

50-I

TCLP Number 12-19-89-D10 Load Number 6377

[redacted] Waste Code 1 D004 2 D007 3 [illegible] 4

#	Metal	Total	Stabilized
1	Arsenic	409	
2	Barium	0.01	
3	Cadmium	2.63	
4	Chromium	122	
5	Lead	16.5	
6	Mercury		
7	Nickel	120	
8	Selenium	53.8	
9	Silver	17.8	
10	Thallium	10.8	

Comments PRETREATMENT - D CODE STUDY - LIQUID SAMPLE FILTERED ONLY

Waste Mass	Comp 1 Mass	Component 1
	Comp 2 Mass	Component 2
	Comp 3 Mass	Component 3
	Comp 4 Mass	Component 4
	Comp 5 Mass	Component 5

Not STABILIZED

Final Volume Initial Volume Volume Increase 0

COMMENT NUMBER: 8-B-1
DOCKET NUMBER: LD12-00050
COMMENTER: Hazardous Waste Treatment Council
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Data
RESPONSE

The Agency thanks the commenter for submitting treatment performance data for the stabilization of D007 wastes. While the commenter presented treatment data for various chromium waste streams, the Agency determined that only 10 data points from the entire data submission for D007 contained complete information necessary to meet the BDAT data quality criteria. This is due to the fact that although untreated total chromium concentrations were given for the corresponding treated waste TCLP concentrations, the untreated TCLP values were only available for 10 data points from 5 select waste streams. This was determined from review of Table II and Attachment I of the comments. The untreated TCLP values are necessary for comparing the corresponding treated TCLP values in order to determine if the stabilization treatment is effective treatment, (i.e., did the untreated waste even require treatment). Based on these 10 data points the Agency calculated a standard of 0.74 mg/l (as measured by TCLP in the extract).

However, the commenters' data contained an additional 32 incomplete treatment data points (no TCLP analyses) many of which could not meet the 0.74 mg/l treatment standard based on the 10 data points from HWTC or the 0.86 mg/l treatment standard based on Cyanokem's 10 data points. assuming that these additional 32 data points represent valid treatment, the Agency decided that both the 0.86 mg/l and the 0.74 mg/l standards calculated on just 20 data points were not routinely achievable. The Agency found that it was difficult to ascertain (per treatment facility) the mixing ratios of waste volumes that were received from each of the different industries. While the data indicate that some wastes contained

COMMENT NUMBER: 8-B-1 (continued)
DOCKET NUMBER: LD12-00050
COMMENTER: Hazardous Waste Treatment Council
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Data
RESPONSE

very high concentrations of chromium, the lack of information on mixing ratios and feed rates make it difficult to assess the true effectiveness of treatment (i.e., the Agency could not determine the chromium concentration of the mixed D007 waste prior to treatment.

The Agency points out that the data from Cyanokem represented primarily treatment of liquid wastes (some with very high concentrations of chromium). Some of the sludges generated from this process did not require further treatment (i.e., stabilization). This same situation occurred in generating the promulgated treatment standards of K062 wastes, in that the wastewater treatment process employed for treating the combined K062/D007 wastes was effective enough that the treatment sludges were not characteristic for chromium and did not require any further stabilization. (Thus, the derivation of the 0.094 mg/l proposed standard for D007 wastes.) While Cyanokem's data clearly indicated that the proposed 0.094 mg/l could not be achieved and thus implying that their combined D007 wastes were more difficult to treat, their data did not represent wastes similar to those represented by the HWTC data which was comprised primarily of sludge stabilization data.

As a result of these comments and data, EPA is withdrawing both of the proposed treatment standards for D007 wastes (i.e., the transfer from F006 and from K062). While the Agency contemplated promulgating the 5.2 mg/l F006 standard, it is even closer to the characteristic level than the 4.3 mg/l calculated using the commenters' data (i.e., Cyanokem data and 42 data points from HWTC). The treatment standard promulgated today,

COMMENT NUMBER: 8-B-1 (continued)
DOCKET NUMBER: LD12-00050
COMMENTER: Hazardous Waste Treatment Council
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatment Data
RESPONSE

therefore, is set at 5.0 mg/l chromium (total) (as measured by TCLP). While the majority of commenters supported this approach from a policy standpoint, the Agency is convinced that the available data submitted by them clearly indicate the validity of the achievability of this standard.

Comment Number: 8-C-1
Docket Number: LD12-00078
Commenter: Glass Packaging Institute
Issue: 8-Chromium (D007)
Subissue: Treatability group
Comment:

B. Chrome-bearing Brick

GPI is currently conducting tests to determine the effectiveness of stabilization at decreasing the leachability of chromium in chrome-containing bricks removed from glass furnaces. Unlike flue slag, the sulfate content of brick waste is not significantly higher than the wastes EPA used to establish BDAT for these metals. However, the brick's physical composition and waste generation rate may be unique, thus warranting special consideration.

Unlike sludge, bricks must be pulverized before they are treated, thus requiring stabilization vendors to purchase special equipment to conduct this step. Such equipment will have to be fairly large, given that when a typical furnace is repaired, about 300 tons of waste are produced. Such bricks are not unique to the glass industry. Cement and lime manufacturers, and other types of kilns use chromium-containing refractories as well, and thus may be contributing to the volume of D007 waste requiring crushing before stabilization.

As for HTMR, chrome-containing bricks are used in glass furnaces because they are heat resistant. Thus, a technology like HTMR, which involves melting waste in order to volatilize certain metals, is inappropriate for these bricks.

COMMENT NUMBER: 8-C-1
DOCKET NUMBER: LD12-00078
COMMENTER: Glass Packaging Institute
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

The Agency thanks the commenter for the comments regarding the need for special consideration with respect to the physical composition of chrome-containing bricks. The commenter points out that high temperature metals recovery (HTMR) will not be effective for treating these bricks.

The Agency also received comments requesting that the Agency clarify the appropriate treatment for characteristic metal wastes that are identified as slags, glass, concrete, bricks, and other inorganic soil debris. The Agency agrees that these, as well as other similar wastes, form a different treatability group, and is identifying this group of D007 waste as the "inorganic solids debris" treatability group. Wastes in this treatability group include the commenters refractory brick containing chrome. The waste constituting this treatability group are defined in Section 268.2(a)(7) of today's final rulemaking.

While the Agency is establishing a separate treatability group for these "inorganic solids debris" it is promulgating the same concentration-based treatment standards for these wastes as for other characteristic metal waste. Thus, there are no separate treatment standards for inorganic solid debris D007 wastes appearing in today's rule. The Agency has determined, however, that there is a national capacity shortage for treatment of this treatability group. Therefore, the standards for D007 wastes do not apply to inorganic solids debris util May 8, 1992. For further details on this issue see Section III.A.3.(a)(2) of today's Final Third Third Rule.

Comment Number: 8-C-2
Docket Number: LD12-00078
Commenter: Glass Packaging Institute
Issue: 8- Chromium (D007)
Subissue: treatability group
Comment:

A. Flue Slag

The Agency's rationale for proposing BDAT standards based on stabilization is that "most metals are amenable to conventional metal hydroxide or sulfur precipitation and stabilization." Preamble at 48,429/1. Because characterization data are limited, the proposed treatment standards for many metal-bearing wastes are based on a transfer of performance data from other wastes containing these metals having similar waste characteristics. Id. at 48,429/2. The Agency describes most metal-waste matrices as being inorganic solutions, wastewater treatment sludges, or incinerator ash-type residues. Coincidentally, the performance data EPA used to develop the proposed standards for D006, D007 and D008 represent each of these matrices: K062 (inorganic solution), F006 (wastewater treatment sludge) and K061 (electric arc furnace dust). In terms of physical composition, flue slag is more like K061 than the other two wastes.

Comment Number: 8-C-2 (Cont)
Docket Number: LD12-00078
Commenter: Glass Packaging Institute
Issue: 8-Chromium (D007)
Subissue: Treatability group
Comment:

EPA's background document on treatment technologies lists the following waste components that determine whether stabilization will achieve the same level of performance on an untreated as on a previously tested waste: fine particulates, oil and grease, organic compounds, chloride compounds and sulfate compounds. [6] The last component is relevant to flue slag because it typically contains 65 percent sulfates (*see* Table 1), as compared to K061, for example, which contains less than 1 percent sulfates. According to EPA:

> Sulfate and chloride compounds interfere with the stabilization chemical reactions, weakening bond strength and prolonging setting and curing time. Sulfate and chloride compounds may reduce the dimensional stability of the cured matrix, thereby increasing leachability potential. If the concentration of sulfate and chloride compounds in the untested waste is significantly higher than in the tested waste, the system may not achieve the same performance. [7]

Although GPI has no stabilization data on flue slag, we believe that its high sulfate content will preclude meeting the proposed limits for D006, D007 or D008 waste. GPI has arranged to have such data generated, which should be available in February. [8]

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[6] U.S. Environmental Protection Agency, Office of Solid Waste, *Treatment Technology Background Document* 18-3 (1989).

[7] *Id*. 18-5.

[8] The thirty (30) day deadline required in the proposed rule to submit such data was unachievable for this waste because of the twenty-eight (28) day curing time aspect of conducting stabilization tests on hazardous waste.

Comment Number: 8-C-2 (cont)
Docket Number: LD12-00078
Commenter: Glass Packaging Institute
Issue: 8-Chromium (D007)
Subissue: Treatability Group
Comment:

Regarding HTMR, the metal with the highest concentration in flue slag is chromium, with a typical concentration of about 6 percent (*see* Table 1). The background document for D007 waste states that data on K061 indicates that HTMR is "demonstrated" for chromium-containing waste. However, this data was not used as the basis for the proposed BDAT limits because EPA lacked TCLP leachate data on untreated D007 waste, which apparently prevented the Agency from determining whether a significant reduction in the waste's chromium content occurred. Background Document, at 4-2.

Even if EPA were to obtain such leachate data, the low chromium (and other metals) content of flue slag makes HTMR inappropriate as the basis for establishing BDAT standards for this waste. Although HTMR has been demonstrated on K061, it is required only for sludges with greater than 15% zinc, more than twice the metals content in container glass flue slag. Furthermore, EPA's background document on treatment technologies describes the metal content of waste amenable to HTMR as being between 10 and 70 percent (Background Document, at 15-1), well above the metals content of flue slag. Therefore, HTMR cannot be used to establish BDAT limits for this waste.

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[8] (...continued)
of the twenty-eight (28) day curing time aspect of conducting stabilization tests on hazardous waste.

COMMENT NUMBER: 8-C-2
DOCKET NUMBER: LD12-00078
COMMENTER: Glass Packaging Institute
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

The Agency acknowledges the commenter's assertion of the difficulties in treating flue slag containing chromium, noting the interference of sulfate and chloride compounds to effective stabilization, and the fact that high temperature metals recovery may not be an effective technology for this waste.

The Agency also received comments requesting that the Agency clarify the appropriate treatment for characteristic metal wastes that are identified as slags, glass, concrete, bricks, and other inorganic soil debris. The Agency agrees that these, as well as other similar wastes, form a different treatability group, and is identifying this group of D007 waste as the "inorganic solids debris" treatability group. Wastes in this treatability group include the commenters refractory brick containing chrome. The waste constituting this treatability group are defined in Section 268.2(a)(7) of today's rule.

While the Agency is establishing a separate treatability group for these "inorganic solids debris" it is promulgating the same concentration-based treatment standards for these wastes as for other characteristic metal waste. Thus, there are no separate treatment standards for inorganic solid debris D007 wastes appearing in today's rule. The Agency has determined, however, that there is a national capacity shortage for treatment of this treatability group. Therefore, the standards for D007 wastes do not apply to inorganic solids debris until May 8, 1992. For further details on this issue see Section III.A.3.(a)(2) of today's Final Third Third Rule.

Comment Number: 8-C-3
Docket Number: LD12-00237
Commenter: DURIRON COMPANY
Issue: D007-CHROMIUM
Subissue: TREATABILITY GROUP
Comment:

Dear Sirs:

The Duriron Company, Inc., operates a stainless steel and high-silicon iron foundry (SIC3325) in Dayton, Ohio. Having reviewed the subject proposal, we are concerned about the treatment requirements for EP-Toxic metal wastes, in particular, the requirements for chromium. In producing castings using the "lost-wax" process a "core" of sand and ceramic material is trapped inside the casting. Common industry practice involves immersing the casting into a high temperature molten salt bath to dissolve this "core", leaving a precision casting ready for finishing. At Duriron we employ a molten salt bath containing a material known as Kolene (see attached MSDS). Kolene contains 85% Sodium Hydroxide plus lesser amounts of Sodium Chloride, Sodium Carbonate, Sodium Floride, and Sodium Aluminate. The Kolene is heated, melted, and placed into the cleaning bath which is maintained at 1000°F. The casting cleaning process generates a considerable amount of scale and sludge which is removed daily and placed into 55-gallon accumulation drums for proper disposal. This waste material, which contains EP-Toxic levels of Chromium (20mg/l), solidifies to the consistency of concrete when it cools. We do not believe that a suitable disposal technology exists other than landfilling.

Your proposed treatment requirement for D007 nonwastewaters (FR54 No. 224, Nov. 22, 1989, Pg. 48437) specifies that stabilization be utilized to reduce chromium leachability to below 0.094mg/l , using TCLP analysis. Imposition of such an across-the-board requirement would result in enormous disposal cost increases and would be counter-productive to waste minimization efforts. Wastes such as ours would have to be removed from the drum, (no easy task considering the density and rock-like nature of the waste) then ground or pulverized in a device such as a hammermill. Only then could stabilization additives be incorporated with the waste (if such effective additives exist for this waste). As you can see, each step in the "reprocessing" of this solid material would result in additional potential human exposure to the waste and would substantially increase the volume of waste for eventual landfilling.

COMMENT NUMBER: 8-C-3
DOCKET NUMBER: LD12-00237
COMMENTER: Duriron Company
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

The Agency also received comments requesting that the Agency clarify the appropriate treatment for characteristic metal wastes that are identified as slags, glass, concrete, bricks, and other inorganic soil debris. The Agency agrees that these, as well as other similar wastes, form a different treatability group, and is identifying this group of D004 through D011 waste as the "inorganic solids debris" treatability group. Wastes in this treatability group include the commenters refractory brick containing chrome. The waste constituting this treatability group are defined in Section 268.2(a)(7) of today's rule. These wastes are described as "nonfriable" inorganic solids that are incapable of passing through a 9.5 mm standard sieve that requires cutting, or crushing and grinding in mechanical sizing equipment prior to stabilization. These wastes are limited to the following inorganic or metal materials: (1) metal slags (either dross or scoria); (2) glassified slag; (3) glass; (4) concrete (excluding cementitious or pozzolanic stablized hazardous wastes); (5) masonry and refractory bricks; (6) metal cans, containers, drums, or tanks; metal nuts, bolts, pipes, pumps, valves, appliance, or industrial equipment; and (8) scrap metal as defined in 40 CFR Part 261.1(c)(6).

While the Agency is establishing a separate treatability group for these "inorganic solids debris" it is promulgating the same concentration-based treatment standards for these wastes as for other characteristic metal waste. Thus, there are no separate treatment standards for inorganic solid debris D007 wastes appearing in today's rule. The Agency has determined, however, that there is a national

COMMENT NUMBER: 8-C-3
DOCKET NUMBER: LD12-00237
COMMENTER: Duriron Company
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

capacity shortage for treatment of this treatability group. Therefore, the standards for D007 wastes do not apply to inorganic solids debris util May 8, 1992. For further details on this issue see Section III.A.3.(a)(2) of today's Final Third Third Rule.

Comment Number: 8-C-4
Docket Number: LD12-00120
Commenter: The PQ Corporation
Issue: 8- Chromium (D007)
Subissue: Treatability group
Comment:

PQ Corporation is submitting comments with respect to the referenced proposed rule published in the November 22, 1989 issue of the Federal Register.

PQ Corporation is an international manufacturer of silicate chemicals. In the United States, PQ has fifteen locations and employs 1500 people.

PQ is generally a small quantity generator of hazardous waste. However, some of our facilities have furnaces which contain chromium dioxide refractory. As this brick abrades, dust is generated which exceeds the EP toxicity level of 5.0 mg/l for chromium. While the brick itself is not a characteristically hazardous waste, when our furnaces are repaired or rebuilt a quantity of dust is generated which is hazardous. Recent EP toxicity tests indicate leachable chromium at 500-600 ppm. The treatment standard you propose is .094 mg/l. Please note that PQ has discontinued using the chrome brick. As the brick is taken out of service it is replaced with different refractory which does not create hazardous waste.

In order to determine whether PQ's waste could be treated, samples were taken of the waste. The waste was then stabilized using two methods: fixation in a glass matrix and fixation using concrete. A TCLP was performed on each sample to determine the leachable chromium concentration. The data is documented in Appendix I.

The data indicates that both methods are capable of significantly reducing the chrome content. However, neither method was able to show a reduction to .094 mg/l or even 5.2 mg/l of total chromium. While 5.2 mg/l is probably achievable using cement, the ratios indicate that the volume of hazardous waste would increase significantly. One ton of untreated waste would likely generate 4-5 tons of waste. To reduce the leachable chrome to .094 mg/l would create tremendous quantities of solid waste. Even a 4:1 ratio is absurd given current landfill capacity concerns.

Comment Number: 8-C-4 (continued)
Docket Number: LD12-00100
Commenter: The PQ Corporation
Issue: 8- Chromium (D007)
Subissue: Treatability group
Comment:

The idea of detoxifying the waste is well intentioned, but to increase waste quantities fourfold is counter to waste minimization. Either a higher treatment standard should be employed or chromium waste should be granted a waiver until appropriate technology is developed.

Since a technology for dust is not readily apparent, PQ recommends that the leachate concentration be increased to at least 100 ppm. This number appears to be achievable based upon our laboratory test results. Additionally, the volume would increase by a factor of about 2.0-2.5 as opposed to 4, depending on to the technology chosen.

Finally, while PQ supports the intent of these regulations, all contingent factors must be weighed. The most important of these is what happens to the increased waste volume generated. While your data may indicate a much lower leachate concentration, the cost in terms of increased solid waste volume, must be considered versus the disposal of lower-volume, higher-concentration stabilized waste. The latter conserves landfill space while still detoxifying to a certain extent. Assuming placement in a RCRA landfill, human health and the environment are well protected.

PQ appreciates the opportunity to comment of these proposed regulations. We hope that our data will allow EPA to reach a reasonable conclusion regarding leachable chromium.

LD12-00120.n
8-C-4

APPENDIX I

CHROMIUM WASTE STABILIZATION RESULTS

STABILIZATION TECHNIQUE - CEMENT

	Sample #1 (Unground)		Sample #2 (Ground)	
Chromium Waste	75	grams	50	grams
Portland Cement	190	"	50	"
Water	75	"	25	"
Flyash	10	"	0	"
Sodium Silicate (Liquid)	8	"	5	"
TCLP	8.5 ppm		70 ppm	

Sample #1, unground, varied from pea size to walnut size.
Sample #2, ground, was about the size of BB shot.

STABILIZATION TECHNIQUE - GLASSIFICATION

	Sample #1 (Unground)		Sample #2 (Ground)	
Soda Lime Glass	50	grams	50	grams
Chromium Waste	40	"	40	"
Sodium Silicate (Powder)	10	"	10	"
TCLP	110 ppm		61 ppm	

MIG:002
1-05-90

COMMENT NUMBER: 8-C-4
DOCKET NUMBER: LD12-00120
COMMENTER: PQ Corporation
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

The Agency thanks the commenter for their comments and for submitting stabilization treatment performance data on chromium wastes, i.e., dust from abrading chromium dioxide refractory bricks.

The commenter submitted stabilization data for treatment of refractory brick dust. One set of data showed stabilization treatment of chromium waste with two treated values, (i.e., 8.5 ppm and 70 ppm for unground and ground samples respectively). The other set of data showed stabilization (glassification) with two treated values of 110 ppm and 61 ppm for unground and ground samples respectively. Because this data lacked Quality Assurance/Quality Control (QA/QC), and only provided 2 data points for the treated concentrations from each treatment technology i.e., cement stabilization and glassification. These two data points resulted in very high variability factors that would yield standards far above 100 ppm.

The Agency also received comments requesting that the Agency clarify the appropriate treatment for characteristic metal wastes that are identified as slags, glass, concrete, bricks, and other inorganic soil debris. The Agency agrees that these, as well as other similar wastes, form a different treatability group, and is identifying this group of D007 waste as the "inorganic solids debris" treatability group. Wastes in this treatability group include the commenters refractory brick containing chrome. The waste constituting this treatability group are defined in Section 268.2(a)(7) of today's rule. These wastes include:

COMMENT NUMBER: 8-C-4 (continued)
DOCKET NUMBER: LD12-00120
COMMENTER: PQ Corporation
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

"nonfriable inorganic solids that are incapable of passing through a 9.5 mm standard sieve that require cutting, or cushing and grinding in mechanical sizing equipment prior to stabilization. These wastes are limited to the following inorganic or metal metal materials: (1) metal slags (either dross or scoria); (2) glassified slag; (3) glass; (4) concrete excluding cemetitious or pozzolanic stabilized hazardous wastes; (5) masonry and refractory bricks; (6) metal cans, containers, drums, or tanks; metal nuts, bolts, pipes, pumps, valves, appliance, or industrial equipment; and scrap metal as defined in 40 CFR Part 261.1(c)(6).

While the Agency is establishing a separate treatability group for these "inorganic solids debris" it is promulgating the same concentration-based treatment standards for these wastes as for other characteristic metal waste. Thus, there are no separate treatment standards for inorganic solid debris D007 wastes appearing in today's rule. The Agency has determined, however, that there is a national capacity shortage for treatment of this treatability group. Therefore, the standards for D007 wastes do not apply to inorganic solids debris util May 8, 1992. For further details on this issue see Section III.A.3.(a)(2) of today's Final Third Third Rule.

Comment Number: 8-C-5
Docket Number: LD12-00159
Commenter: WASTE MANAGEMENT, INC., /CHEMICAL WASTE MGMT
Issue: 8- Chromium D007
Subissue: Treatability group
Comment:

2. Cadmium and Chromium Wastes

Although smaller in quantity than radioactive wastes containing mercury and lead, there are substantial quantities of radioactive cadmium and chromium wastes. Therefore, it would be beneficial for EPA to establish separate "best demonstrated available technologies" ("BDAT") for the cadmium and chromium radioactive wastes, as EPA has done for radioactive wastes containing mercury and radioactive lead solids. See, e.g., 54 Fed. Reg. at 48,513.

COMMENT NUMBER: 8-C-5
DOCKET NUMBER: LD12-00159
COMMENTER: Waste Management, Inc./Chem Waste Management
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

The Agency thanks the commenters for their remarks, however, the commenter has not submitted any treatment performance data on radioactive chromium waste to justify establishing a separate "best demonstrated available technology." If the commenter believes that their waste is unique to the extent that it cannot be treated to the promulgated treatment standards of 5.0 mg/l in the TCLP leachate for D007 nonwastewaters and 5.0 mg/l for total concentration for D007 wastewaters, then data should be presented to the Agency to justify this claim. The commenter is reminded that they have the option of applying for a treatment variance for any waste that they believe may not be able to achieve the treatment standard.

Comment Number: 8-C-6
Docket Number: LD12-00195
Commenter: Covington & Burling
Issue: 8- Chromium (D007)
Subissue: Treatability group
Comment:

2. Proposed BDAT For D007

In its BDAT Background Document for D007, the Agency identified two technologies for the treatment of nonwastewaters: high temperature metals recovery and stabilization. D007 Background Document at 3-2 (in this section D007 nonwastewaters are identified as wastewater treatment sludges and ash or slag from incineration or metallurgical processes).

(i) High Temperature Metals Recovery

In high temperature metals recovery, the chromium-contaminated material is mixed with fluxing agents and heated in a furnace to result in the reduction and volatilization of the metals. See Proposed Treatment Technology Background Document, F89-LD12-S1057 (1989), at section 15 (hereinafter Treatment Technology Background Document). This treatment is demonstrated for baghouse dusts and dewatered scrubber sludge from the production of steels and ferroalloys. Id. at 15-1. The performance data for this technology is based on the treatment of K061 wastes. See D007 Background Document at 4-2.

As U.S. EPA has recognized, it does not have data showing that all forms of D007 nonwastewaters are amenable to treatment by recovery technology. Id. at 5-2. Thus, this technology was not identified as BDAT for D007 wastewaters. Id.

OCF agrees with U.S. EPA that this technology cannot be universally applied to D007 nonwastewaters. For example, this treatment has been demonstrated for some refractory brick, but not for all D007 refractory or for glass slag. "To be considered demonstrated, a technology must be used in a full-scale operation for treatment of the waste or a similar waste." BDAT Methodology Document at 10. Refractory brick and glass slag is generated in the form of large bricks and pieces that cannot be mixed with fluxing agents, and existing high temperature metals recovery facilities do not have grinding mechanisms to reduce the refractory brick and glass slag to treatable forms. Similarly, this treatment is not available for all refractory brick or for glass slag. To be available, a technology must be commercially available. Id. at 12. OCF has identified no commercial high temperature metals recovery facility that will take OCF's low chromium refractory bricks and slags.

Comment Number: 8-C-6
Docket Number: LD12-00195
Commenter: Covington & Burling
Issue: 8 - Chromium (D007)
Subissue: Treatability group
Comment:

(ii) Stabilization

In stabilization, leachable metals in a waste are immobilized by adding stabilizing agents and other chemicals to the waste. A lattice structure and/or chemical bonds bind the metals to form a solid matrix that does not leach metals. See Proposed Treatment Technology Background Document at 18-1. This treatment is applicable to wastes with leachable metals, a high filterable solids content, and a low organic and oil and grease content. See id. In addition, to be amenable to the stabilization process, the wastes must be mixable and pumpable. See BDAT Background Document for K062, EPA/530-SW-88-031E (1988), at 3-35; BDAT Background Document for F006, EPA/530-SW-88-031L (1988), at 3-7.

U.S. EPA identified this technology as BDAT for D007 nonwastewaters, believing that it could be applied to all wastes in this treatability group. D007 Background Document at 5-2. However, the Agency's belief is incorrect. This treatment is not applicable to OCF's D007 wastes. As noted above, these wastes consist of large pieces of completely solid material. Indeed, the refractory brick and glass slag is already stabilized, but the chromium contamination is on the surface. OCF is aware of no demonstration of this technology on refractory brick or glass slag and is aware of no facility that currently will treat such wastes.

Although the Agency has identified refractory brick as a D007 nonwastewater, in identifying BDAT for these wastes, the Agency examined only data from F006, K061 and K062 wastes. Clearly, the Agency has ignored an entire subcategory of wastes in establishing the BDAT and treatment standards for D007 nonwastewaters. While it may be true that "EPA believes that the treated F006 and K062 wastes were similar to D007 wastewater treatment sludges in terms of waste characteristics and chromium concentrations," or that "[t]he Agency believes that the tested K061 was similar in waste characteristics to many D007 wastes (such as off-specification chromium chemicals and incinerator ash residues containing chromium)," D007 Background Document at 4-2, such observations have no relevance to OCF's D007 wastes or to the refractory bricks of other generators. As is demonstrated in the chart found in Attachment A, refractory brick and glass slag are very different from these wastes.

8-C-6

LD12-0019:

Attachment A

WASTE STREAM COMPARISON

ITEM	F006	K062	K061	D007	OCF D007
WASTE TYPE	Wastewater treatment sludge from electroplating process	Spent pickle liquor from steel finishing operations	Emission control dust/sludge collected from electric steel furnaces	Wastes that are EP toxic for Chromium	Refractory brick, glass slag
PROPOSED CHROMIUM STANDARD (mg/l)	5.2	0.094	5.2	0.094	0.094
SOLIDS/MOISTURE	24-98% moisture	<100 ppm filterable solids	high zinc - 12% moisture low zinc - 6% moisture	10-14% moisture	~0% moisture
BDAT	Stabilization	Chemical precipitation, dewatering, then stabilization or HTMR	HTMR (high zinc) Stabilization (low zinc)	Stabilization	HTMR and stabilization not possible without size reduction. Currently treatment is not available.
PHYSICAL STATE	Sludge	Liquid -> sludge	Dust/sludge	Dust/sludge	Hard bricks/ chunks Modulus of Rupture = 5000-8000 psi

HTMR = high temperature metal recovery

COMMENT NUMBER: 8-C-6
DOCKET NUMBER: LD12-00195
COMMENTER: Covington & Burling
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

The Agency also received comments requesting that the Agency clarify the appropriate treatment for characteristic metal wastes that are identified as slags, glass, concrete, bricks, and other inorganic soil debris. The Agency agrees that these as well as other similar wastes form a different treatability group, and is identifying this group of D004 through D011 Waste as the "inorganic solid debris" treatability group. Waste in this treatability group are defined in Section 268.2(a)(7) of today's rule. This treatability group includes D007 Refractory bricks. For further information on this treatability group see today's final rulemaking Section III.A.

While the Agency is establishing a separate treatability group for these "inorganic solids debris" it is promulgating the same concentration-based treatment standards for these wastes as for other characteristic metal waste. Thus, there are no separate treatment standards for inorganic solid debris D007 wastes appearing in today's rule. The Agency has determined, however, that there is a national capacity shortage for treatment of this treatability group. Therefore, the standards for D007 wastes do not apply to inorganic solids debris util May 8, 1992. For further details on this issue see Section III.A.3.(a)(2) of today's Final Third Third Rule.

Comment Number: 8-C-7
Docket Number: LD12-00105
Commenter: American Chrome & Chemicals, Inc.
Issue: 8-Chromium (D007)
Subissue: Treatability group
Comment:

With regard to treatment standards for soil and debris, we believe that the requirement for individual site-specific variances is unnecessarily burdensome at least for D007 wastes. We doubt that there exists sufficient treatment capacity able to achieve the characteristic level much less the very low TCLP extract values proposed for non-wastewater D007 wastes. We are now conducting our own survey in an attempt to identify suitable treatment facilities but do not yet have any responses. As noted in Sections III.A.8. and III.B.3. debris may consist of a wide variety of materials. We expect that most of these will have to be reduced in size to that specified by the TCLP test before treatment is performed. Reducing the size after treatment but before testing is likely to expose additional leachable chromium. We do not believe that treatment facilities have adequate comminution equipment to accomplish this for the wide variety of wastes involved. We request that a national variance for D007 soil and debris be granted until treatability groups and treatment standards can be established or it can be verified that there are treatment facilities with the necessary equipment.

COMMENT NUMBER: 8-C-7
DOCKET NUMBER: LD12-00105
COMMENTER: American Chrome & Chemicals, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

The Agency is not issuing a national variance for D007 soil and debris with this rulemaking except for D007 chromium refractory brick, for which the Agency is issuing a two-year capacity variance. This is because the Agency received many comments and treatment performance data indicating that there may be special treatment considerations necessary for these wastes.

If the commenter believes that their wastes also will not meet the regulatory levels being promulgated in this final rulemaking (i.e., characteristic level of 5.0 mg/l for D007 nonwastewater in the TCLP extract), then they must submit treatment data to the Agency to substantiate their claim. The Agency lacks sufficient data to establish a national variance for D007 soil and debris. However, EPA is currently preparing a separate rulemaking that will establish treatability groups and treatment standards for contaminated soil and debris.

Until then, soil and debris unless it is in the inorganic solids and debris treatability group (see Section III.A.3.(a)(2) of today's Final Third Third Rule for further details) contaminated with wastes subject to the land disposal restrictions are likewise subject to the restrictions. Therefore, contaminated soil and debris must meet the promulgated treatment standards for the contaminating hazardous wastes prior to land disposal.

Comment Number: 8-C-8
Docket Number: LD12-L0058
Commenter: GLASS PACKAGING INSTITUTE
Issue: 8-Chromium-D007
Subissue: Treatability Group
Comment:

I. Flue Slag

PQ's comments indicate that its facilities generate a flue slag similar to that generated by GPI members, except that PQ's flue slag generates leachable chromium at higher concentrations than GPI members (500-600 ppm vs. 20 ppm chromium). PQ's stabilization data confirmed GPI's January 5, 1990 comments that the proposed .094 mg/l chromium treatment level for D007 waste is unachievable in that the TCLP extract from PQ's stabilized treatment residues contains at least 50 mg/l chromium.

The attached report, prepared by Roy F. Weston, Inc. for GPI, provides yet further evidence that the proposed treatment standard of .094 mg/l chromium is unachievable for flue slag. Using various stabilization agents, the best results achieved by Weston in reducing the TCLP concentration for chromium are at least an order of magnitude above the proposed standard. Cement generally is the best stabilization agent for reducing the leachable metals content in flue slag for not only chromium, but cadmium and lead as well. However, EPA should not use the cement data alone as the basis for establishing treatment levels for this waste, as the leachate generated from the cement-stabilized waste frequently exhibits the RCRA corrosivity characteristic (D002).

In summary, flue slag cannot be stabilized to achieve the proposed limits applicable to this waste. Accordingly, GPI suggests that EPA promulgate the method of stabilization rather

Comment Number: 8-C-8 (Con't)
Docket Number: LD12-L0058
Commenter: GLASS PACKAGING INSTITUTE
Issue: 8-Chromium - D007
Subissue: Treatability Group
Comment:

than specific stabilization-based treatment limits for metal-containing wastes such as flue slag.

COMMENT NUMBER: 8-C-8
DOCKET NUMBER: LD12-L0058
COMMENTER: Glass Packaging Institute (GPI)
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

If the commenter believes that their wastes are unique enough to the extent that the treatment standard cannot be met, then data should be presented to the Agency to support this claim.

For the final rule, the Agency has promulgated a treatment standard of 5.0 mg/l in the TCLP extract (the characteristic level for D007 wastes) for D007 nonwastewaters. The Agency received numerous comments and treatment data on D007 wastes indicating that the proposed treatment standard of 0.094 mg/l may not be routinely achievable for all forms of D007 waste matrices.

The commenter pointed out that the stabilization data from PQ Corporation and a report from Roy F. Weston Inc. proved that the proposed standard of 0.094 for D007 wastes cannot be achieved.

The Agency reviewed the PQ stabilization data (see Docket Number LD12-00120) and although this data suggests that the proposed standard of 0.094 mg/l is unachievable for D007 refractory brick, these data were lacking in Quality Assurance/Quality Control. Further, there were only 2 data points available for each treatment technology i.e., cement stabilization and glassification. However, if standards were calculated from these two data points the standard would exceed 100 mg/l.

In any case GPI data are for slag, where PQs are for brick dust, therefore it is not clear if these nonwastewaters will perform similarly in similar treatment processes.

COMMENT NUMBER: 8-C-8 (continued)
DOCKET NUMBER: LD12-L0058
COMMENTER: Glass Packaging Institute
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

Therefore, the commenter suggested that the Agency establish a technology-based standard (i.e., stabilization) in lieu of a concentration-based treatment standard for D007 waste such as flue slag.

The Agency also received comments requesting that the Agency clarify the appropriate treatment for characteristic metal wastes that are identified as slags, glass, concrete, bricks, and other inorganic soil debris. The Agency agrees that these as well as other similar wastes form a different treatability group, and is identifying this group of D007 waste as the "inorganic solid debris" treatability group. Waste in this treatability group (including the flue slag) are defined in Section 268.2(a)(7) of today's rule.

While the Agency is establishing a separate treatability group for these "inorganic solids debris" it is promulgating the same concentration-based treatment standards for these wastes as for other characteristic metal waste. Thus, there are no separate treatment standards for inorganic solid debris D007 wastes appearing in today's rule. The Agency has determined, however, that there is a national capacity shortage for treatment of this treatability group. Therefore, the standards for D007 wastes do not apply to inorganic solids debris util May 8, 1992. For further details on this issue see Section III.A.3.(a)(2) of today's Final Third Third Rule.

Comment Number: 8-C-9
Docket Number: LD12-LU058
Commenter: GLASS PACKAGING INSTITUTE
Issue: 8-Chromium-D007
Subissue: Treatability group
Comment:

II. Chrome-Bearing Brick

HWTC's comments summarize the comments submitted by several other companies on the Third-Third rule, all of whom question the feasibility of subjecting refractory brick to stabilization technologies (e.g., HWTC Comments at p. 29). GPI is currently conducting stabilization tests on refractory bricks from glass furnaces. However, this testing has been delayed somewhat due, in part, to the difficulty of obtaining chrome brick representative of the glass industry that exhibits the EP toxicity characteristic. Nonetheless, we hope to supply this data to EPA in a few weeks.

HWTC suggests a novel approach to establishing BDAT for refractory brick. In essence, HWTC suggests that cleaning the debris as best as practicable by removing surficial deposits of waste from refractory brick should be deemed to be BDAT (HWTC Comments at p. 22). We agree with HWTC that this approach would both allow for the safe management of refractory brick and avoid the inevitable burden associated with the proposed rule's reliance on treatability variances. We urge EPA to give serious consideration to HWTC's suggestion regarding establishment of BDAT for refractory brick.

COMMENT NUMBER: 8-C-9
DOCKET NUMBER: LD12-L0058
COMMENTER: Glass Packaging Institute
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

The stabilization data that the commenter stated they would submit has not been received prior to promulgation of this Final Rulemaking.

However, PQ corporation submitted data on the stabilization of refractory bricks. These data indicate that D007 refractory bricks may be more difficult to treat than other chromium containing wastes tested by EPA (K062 or F006); or that stabilization of chromium bricks may need to be preceeded by hexavalent chromium reduction treatment.

The data submitted by PQ corporation was highly variable (i.e., 8.5 mg/l and 70.0 mg/l for cement stablization; and 61.0 mg/l and 110.0 for glassification treatment of refractory brick. Due to the extreme variability of the two data points per technology, they were not used to develop an alternative treatment standard for D007 refractory bricks. However, if treatment standards were developed using these data they would have resulted in a treatment standard exceeding 100 mg/l for chromium in the TCLP leachate.

The Agency also received comments requesting that the Agency clarify the appropriate treatment for characteristic metal wastes that are identified as slags, glass, concrete, bricks, and other inorganic solids debris. The Agency agrees that these as well as other similar wastes form a different treatability group, and is identifying this group of D007 waste as the "inorganic solids debris" treatability group. Waste in this treatability group are defined in Section 268.2(a)(7) of today's rule.

COMMENT NUMBER: 8-C-9 (continued)
DOCKET NUMBER: LD12-L0058
COMMENTER: Glass Packaging Institute
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

While the Agency is establishing a separate treatability group including refractory bricks for these "inorganic solids debris" it is promulgating the same concentration-based treatment standards for these wastes as for other characteristic metal waste. Thus, there are no separate treatment standards for inorganic solid debris D007 wastes appearing in today's rule. The Agency has determined, however, that there is a national capacity shortage for treatment of this treatability group. Therefore, the standards for D007 wastes do not apply to inorganic solids debris util May 8, 1992. For further details on this issue see Section III.A.3.(a)(2) of today's Final Third Third Rule.

Comment Number: 8-C-10
Docket Number: LD12-00133
Commenter: PPG Industries, Inc.
Issue: 8-Chromium (D007)
Subissue: Treatability Group
Comment:

Additionally, periodic repairs of glass melting furnaces can generate used refactory bricks which can be hazardous wastes due to chromium. EPA's proposed BDAT using chromium reduction followed by lime and sulfide precipitation and dewatering is not feasible for large refractory bricks. Currently, some of these refractories are being processed by grinding and recycling into new refractories. However, PPG is not aware of any commercially viable method for treating used chromium refractories which cannot be recycled. A two-year national variance is needed to identify alternative treatment methods for these materials.

PPG recommends that EPA either establish BDAT at the characteristic level for chromium, or alternatively establish a level for chrome VI based on an adequate treatability database.

COMMENT NUMBER: 8-C-10
DOCKET NUMBER: LD12-00133
COMMENTER: PPG Industries, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Treatability Group
RESPONSE

The Agency acknowledges the commenters' remarks and is aware of the problems associated with treating refractory bricks. Due to a lack of treatment or recovery capacity for D007 refractory bricks, the Agency is issuing a two-year national capacity variance for D007 refractory bricks that are surface land disposed.

The Agency also received comments requesting that the Agency clarify the appropriate treatment for characteristic metal wastes that are identified as slags, glass, concrete, bricks, and other inorganic solid debris. The Agency agrees that these as well as other similar wastes form a different treatability group, and is identifying this group of D007 waste as the "inorganic solid debris" treatability group. Waste in this treatability group including refractory bricks are defined in Section 268.2(a)(7) of today's rule.

While the Agency is establishing a separate treatability group for these "inorganic solids debris" it is promulgating the same concentration-based treatment standards for these wastes as for other characteristic metal waste. Thus, there are no separate treatment standards for inorganic solid debris D007 wastes appearing in today's rule. The Agency has determined, however, that there is a national capacity shortage for treatment of this treatability group. Therefore, the standards for D007 wastes do not apply to inorganic solids debris util May 8, 1992. For further details on this issue see Section III.A.3(a)(2) of today's Final Third Third Rule.

Comment Number: 8 - D - 1
Docket Number: LD12 - 00133
Commenter: PPG INDUSTRIES, INC.
Issue: 8 - Chromium (D007)
Subissue: total Chromium vs. Hexavalent and trivalent Chrom
Comment:

D007 Chrome - PPG has repeatedly distinguished between Chrome III and Chrome VI from the standpoint of toxicity. (See, 40 CFR §261.4 (b)(6).) Yet the Agency has proposed a BDAT standard of .094 mg/l for total chromium. This standard is well below the EP Toxicity characteristic level.

Chromium, almost wholly in the trivalent form (chrome III) is a significant constituent of the earth's crustal material averaging about 50 ppm and ranging up to 3.5 g/kg. If EPA's proposed standard is finalized, it is likely that many virgin soils and natural materials would have difficulty complying with it.

COMMENT NUMBER: 8-D-1
DOCKET NUMBER: LD12-00133
COMMENTER: PPG Industries, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Total Chromium vs. Hexavalent and Trivalent Chromium
RESPONSE

The Agency thanks the commenter for providing comments on the proposed rule. The Agency received several objections in addition to the commenters objections to the proposal to regulate total chromium rather than hexavalent chromium in D007 and U032 wastes. For the final rulemaking the Agency is not distinguishing between chrome (III) and chrome (VI), but is promulgating treatment standards for total chromium at the characteristic level of 5.0 mg/l in the TCLP leachate for D007 nonwastewaters.

The Agency maintains that not only will treatment of total chromium provide the most effective treatment of hexavalent chromium, but it is long settled in the RCRA Subtitle C rules that EPA regulates on a total chromium basis unless a generator makes certain specific demonstrations as to the nature of the chromium in the waste, the type of process generating the waste, and the management regime to which the waste will be subject. See 40 CFR Part 261.4(b)(6)(i). (To date, EPA is unaware of any generators filing such a demonstration to the Agency.) No persuasive reason has been offered to change this established regulatory system. Nor does EPA consider this issue to be reopened in this rulemaking.

Comment Number: 8-D-2
Docket Number: LD12-00146
Commenter: LEATHER INDUSTRIES RESEARCH LABORATORY
Issue: 8-Chromium (D007)
Subissue: Total Chromium vs. hexavalent or trivalent Chromium
Comment:

Preamble language concerning proposed treatment standards for metal wastes states that "the Agency is proposing to regulate chromium in wastes as 'total' chromium rather than distinguishing between ---- valence states. This is primarily because of the difficulty in analyzing treatment residues for hexavalent chromium" (54 FR 48436). This reference to the use of total chromium is both confusing and inappropriate for reasons presented below.

1. Wastes which contain exclusively (or nearly exclusively) trivalent chromium are not hazardous wastes [40 CFR 261.4 (b)(6)]. For example, chromium-containing tanning industry wastes are specifically excluded from RCRA regulation with regard to their chromium content [40 CFR 261.4 (b)(6)(ii)(A-G)]. Therefore, these materials would not be subject to the Land Disposal Restrictions at all. Since the RCRA Characteristic of EP Toxicity does distinguish between chromium valences, the preamble statement that the Agency plans to "regulate chromium in wastes as 'total' chromium" is quite confusing and should be clarified. We believe this statement is intended to apply only to the analysis of chromium in RCRA hazardous wastes (primarily hexavalent chromium wastes) following BDAT treatment, but feel this point should be more explicitly clarified. Any other interpretation would effectively alter the Characteristic of EP Toxicity without appropriate rulemaking procedures.

2. Classification of hazardous wastes based on Cr(VI) and the establishment of treatment standards for these wastes based on total chromium is inconsistent and inappropriate. It is clear from the language of 40 CFR 261.4 (b)(6) that Cr(VI) is the pollutant parameter of concern. Therefore, we believe the Land Disposal Restrictions should only address the treatment of this pollutant parameter and not total chromium. BDAT standards based on total chromium could require significant additional treatment to reduce Cr(III) content, which would be overly burdensome and yield no additional environmental benefit. We believe BDAT standards for chromium-containing hazardous wastes should be based on Cr(VI) only and, wherever possible, permit use of chemical reduction technology to meet the standard. Comments submitted by Tanners' Council of America to the RCRA Docket on behalf of the environmental compatibility of Cr(III) wastes are a matter of public record and are hereby incorporated by reference into these comments.

Comment Number: 8-D-2 (Con't)
Docket Number: LD12-00146
Commenter: Leather Industries Research Laboratory
Issue: 8- Chromium (D007)
Subissue: Total Chromium vs hexavalent or trivalent Chromium
Comment:

3. Establishment of BDAT standards on total chromium for analytical reasons is unjustified. The Agency is quite correct that accurate digestion and analysis of solid waste samples for Cr(VI) without valence alteration is exceedingly difficult if not impossible.[2] However, this is not the case for liquid wastes in which the chromium is essentially all in solution. Chromium BDAT treatment standards are proposed for wastewaters and for TCLP leachates from nonwastewaters (54 FR 48437). Both of these are liquid materials, which can be readily analyzed for Cr(VI) using either chelation/extraction (EPA Solid Waste Method 7197) or spectrophotometry (Method 7196). The Leather Industries Research Laboratory at the University of Cincinnati has shown that both these methods can be used successfully for Cr(VI) solutions, even in the presence of a large excess of Cr(III).[3]

2) Messman, J.D. et al., Determination of Stable Valence States of Chromium in Aqueous and Solid Waste Matrices - Experimental Verification of Chemical Behavior, Battelle Columbus Laboratories, U.S. EPA/600/54-86/039 (March 1987)

3) Rutland, F. et al., Problems Associated with Hexavalent Chromium Determination, Leather Industries Research Laboratory, University of Cincinnati (October 1989) - enclosed as Exhibit C

LD12-0146
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8-D-2

PROBLEMS ASSOCIATED WITH HEXAVALENT CHROMIUM DETERMINATION

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October, 1989

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LD12-0146

8-D-2

PROBLEMS ASSOCIATED WITH HEXAVALENT CHROMIUM DETERMINATION

Abstract

The ability to demonstrate that industry products, waste materials and disposal sites are free of hexavalent chromium is of crucial regulatory importance to the leather tanning industry. This requires reliable techniques to extract and detect without alteration small quantities of CrVI from complex sample matrices in the presence of a large excess of CrIII as well as other potential interferents. EPA solid waste methods 7195 (coprecipitation), 7196 (colorimetric) and 7197 (chelation/extraction) are not entirely suitable for this purpose as published, and require some modification to obtain reliable results. This report examines a number of case histories where false positive CrVI results were reported in tannery-related materials by independent testing laboratories, and recommends procedures to be followed in order to avoid these problems. Method 7195 is not recommended for samples with a large excess of CrIII. Methods 7196 and 7197 can provide reliable results given reasonable care and validation.

Introduction

Distinction between the chemical properties, toxicity and environmental fate of trivalent and hexavalent chromium compounds is of vital importance to a major segment of the leather tanning industry. Basic trivalent chromic sulphate $[(H_2O)_5\ CrOH]SO_4$ is the primary tanning agent used for roughly 90 percent of all leather produced in the United States and, despite extensive worldwide research effort, no fully comparable alternative is known at this time. Although some tanning facilities produce their own chrome liquor from sodium dichromate for economic reasons, the tanning reaction itself can only be effected with coordination complexes of CrIII. Small quantities of CrVI in the form of lead chromate pigments have been used in leather finishing, but that usage today is substantially reduced if not totally eliminated. Raw tannery effluent may contain up to several hundred parts per million of chromium1), and typical chrome-tanned leather waste contains 1-4% Cr on a dry weight basis2). This waste chromium from tannery and leather product manufacturing operations is exclusively (or nearly exclusively in trivalent form; the majority is tightly bound to hide protein fibers, and it exhibits relatively low solubility and leachability2).

The chromium valence distinction is important in environmental regulation. Because of the lower solubility, mobility and toxicity of CrIII compounds compare with CrVI, tannery and leather product wastes (including wet blue trimmings and shavings, waste scrap leather, and wastewater treatment sludges) are specifically excluded from federal regulation under the Resource Conservation and Recovery Ac (RCRA)3). A majority of individual states have also adopted this CrIII exclusion, but a few (e.g. CA, ME, NJ and PA) have not, choosing instead to regulate these materials either on a total chromium basis or on a case by case basis. With increasing frequency, some facilities are being required to demonstrate analytically that their waste materials are free of CrVI. This makes the accuracy of CrVI determination, and particularly the avoidance of false positive results, a matter of crucial importance.

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8-D-2

Chromium valence is also of importance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund). Although the CERCLA list of hazardous substances (40 CFR 302.4) includes "chromium and compounds" without valence distinction, study of selected Superfund sites has shown a dramatic difference between CrIII and CrVI wastes in terms of mobility and potential for groundwater contamination4). Thus, future remedial action decisions may well depend on accurate determination of CrVI at Superfund sites. Finally, there is lingering concern about potential environmental interconvertibility of chromium species. This concern is based on laboratory studies of CrIII oxidation in the presence of manganese5). Although this oxidation phenomenon has never been demonstrated in the field and in all likelihood does not occur, it is still responsible for considerable equivocation in chromium regulation. Satisfactory resolution of this concern depends entirely on reliable determination of CrVI in complex soil matrices.

The EPA manual for evaluation of solid waste6) contains four methods for the determination of hexavalent chromium, as follows:

- Method 7195 - Coprecipitation
- Method 7196 - Colorimetric (diphenylcarbazide)
- Method 7197 - Chelation/Extraction
- Method 7198 - Differential Pulse Polarography

Methods 7196 and 7197 are the most commonly used by independent commercial laboratories. Method 7198, to the best of our knowledge, is rarely if ever used. All four methods describe specific interferences, but none mention high concentrations of CrIII, typical of tannery samples. In addition, all four methods recommend utilization of the method of standard additions as a quality control procedure (Method 7000, Section 8.7), but we suspect this may be frequently omitted during commercial analyses for economic reasons. On the whole, there seems to be somewhat greater concern about potential loss of analyte, giving low or negative results, than there is for conditions that might produce false positive or false high results. This latter problem can be of great significance in tannery samples.

Recently, there have been several instances in which independent commercial laboratories reported low levels of hexavalent chromium in various tannery materials that would not be expected to contain CrVI. Analyses of duplicate and/or similar samples by the LIA Laboratory gave comparable results when the same methods were employed without verification. Subsequent work, however, clearly demonstrated that all sample materials were free of CrVI, and that the reported results were false positives, resulting not so much from analytical error but rather from specific artifacts of the methods employed and failure to use appropriate quality assurance procedures. These case histories are described in detail below.

Case Histories

A. Tannery Sludge

Commercial laboratory analysis of a tannery settling pond sludge which contained a significant organic solvent phase gave the following results:

	Result	Methods[6]
Chromium - Total	4000 mg/kg*	3050/7190
Chromium - Hexavalent	5.60 mg/l	3060/7197
Chromium - EP Toxicity	7.4 mg/l	1310/3010/7190

* Dry weight basis

The EP Toxicity test was repeated on a similar sample at the LIA Laboratory with interesting and unexpected results:

- Following extraction and filtration, aqueous and organic phases were immiscible and had to be analyzed separately in accordance with Section 7.17 of Method 1310;

- Over 90% of total chromium extracted was found in the organic phase, which had a distinct blue color characteristic of CrIII solutions.

These results suggested the presence of soluble CrIII compounds in the organic phase, possibly in the form of chrome soaps. Such materials are well known in leather tanning as a reaction product of chrome tanning salts and residual free fatty acids[7]. Their presence would affect the results of the chelation/extraction method, since these materials (being soluble in organic solvent) would extract directly without the chelation step and be reported as CrVI. This would appear to explain the original sample result, and suggests that Method 7197 may not be appropriate for tannery samples. Subsequent work by Menden[8] has verified these conclusions, and produced "positive" CrVI results under each of the following experimental conditions:

- direct sample extraction with MIBK omitting the APDC chelation step;

- incorporation of a reducing agent (L-ascorbic acid) prior to chelation/extraction;

- analysis of synthetic samples spiked with reagent grade chrome III soaps.

These results demonstrate that some tannery waste materials contain organochromium III compounds that are directly soluble in MIBK and produce false positive results with Method 7197; that are still detectable after alkaline digestion (Method 3060); and that are sufficiently water soluble to be detected after EP Toxicity extraction (Method 1310).

B. Hydrolyzed Leather Waste

A different commercial laboratory also using Methods 3060/7197 reported 30-504 ppm CrVI in hydrolyzed leather waste containing ca. 2.7% total chromium (moisture free basis). There is no evidence these results were validated in any way (standard additions, alternative method, etc.). Similar materials were analyzed at the LIA Laboratory using the same methods and we were unable to reproduce the commercial laboratory results. We obtained instead false positive results ranging from 4.8 - 11.6 ppm. These were shown to be false since incorporation of a reducing agent prior to chelation/extraction gave virtually identical results. Additional work by Menden led to the following conclusions for this particular sample matrix:[8]

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- alkaline digestion is not an acceptable procedure for samples of this type since any existing CrVI will be reduced during the digestion process;

- hydrolyzed leather waste also appears to contain organochromium III compounds that survive alkaline digestion and give false positive results with Method 7197.

On the basis of these findings, the original laboratory results were shown to be unreliable.

C. Chrome Liquor

A third commercial laboratory using Method 7197 reported CrVI results ranging from 5.00 - 21.66 mg/kg on twelve samples of wet blue trimmings, shavings and sewer screenings. The method of sample digestion is unknown, and again there was no indication of data verification. In an effort to ascertain a potential source of CrVI, the tannery submitted to the same laboratory a sample of virgin chrome liquor, which also tested positive using chelation/extraction. All of these results were unexpected and contrary to past experience. In view of the earlier problems with this method described above, we recommended an interlaboratory testing program using alternative methods and appropriate quality assurance procedures. Two samples of virgin chrome liquor, each from a different supplier (Samples A and B), were divided four ways and sent to the original commercial laboratory, to each of the supplier laboratories and to the LIA Laboratory. One of the supplier laboratories submitted duplicate samples to a different commercial laboratory for analysis by method 7195. A summary of results is shown on the following page exactly as reported by the testing laboratories. Taken altogether, these data present an interesting and somewhat disturbing picture of the potential pitfalls in routine unvalidated analyses for hexavalent chromium. None of the three official methods most commonly used by commercial laboratories were able to accurately quantify CrVI in chrome tanning liquors without some modification of the published method plus additional validation steps. Coprecipitation gave highly variable and unreliable results due to occlusion of CrIII in the precipitate. This was evidenced by reduced chromium values with subsequent rinsing of the precipitate. Direct colorimetric analysis was not possible due to the deep green color of chrome tanning liquor. In order to utilize this method, it was first necessary to precipitate CrIII (which can be accomplished with Na_2CO_3, NaOH, etc.). As in the other case histories, chelation/extraction gave a small positive result even after incorporation of a reducing agent. Overall, the data indicate that Samples A and B are free of CrVI, and that reported positive results are artifacts of the methods employed. Residual reducing capacity in both samples (which destroyed CrVI spikes) would make the presence of CrVI very unlikely if not impossible.

Other Laboratory Investigations

Messman et al. at Battelle have studied the problems of CrVI analysis in solid waste materials, including tannery sludge, and encountered significant difficulties using the DPC method9). Their results and conclusions (as reported in the EPA Project Summary) are as follows:

- "The DPC spectrophotometric method was found to be sensitive and specific for Cr(VI) in aqueous solutions containing up to 1000-fold ratios of Cr(III);

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Interlaboratory Comparison of Chrome Liquors

	Total Chromium (ppm)	Hexavalent Chromium (ppm) Method 7195	Method 7196	Method 7197	In-House Method
Commercial Laboratory					
Sample A	116,130.00	12.80	----	10.06	----
Sample B	118,160.00[a)]	13.60	----	14.20	----
Supplier I					
Sample A	12.0%	173[b)]	----	c)	< 1
Sample B	11.9%	131[b)]	----	c)	< 1
Supplier II					
Sample A	11.88%	2310[d)]	----	----	0.0
Sample B	12.07%	406[d)]	----	----	0.0
LIA Laboratory					
Sample A					
As received	12.14%	e)	0.4[f)]	1.8	----
With reducing agent[g)]				1.4	
With CrVI spike			h)	1.8[i)]	
Sample B					
As received	12.80%	e)	-0.4[f)]	6.6	----
With reducing agent[g)]				4.8	
With CrVI spike			h)	6.5[i)]	

a) Originally reported as 1,188,160.00 ppm (i.e. 119%)
b) Values representative of CrIII retained in precipitate - method unsuitable
c) Method yielded erratic irreproducible results
d) Independent commercial laboratory - no indication of data validation
e) Method unreliable due to CrIII occlusion
f) CrIII removed by precipitation with sodium carbonate
g) L-ascorbic acid
h) CrVI spikes up to 30 µg/g of chrome liquor were not recovered
i) CrVI spike of 18 µg/g of chrome liquor

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- "Problems of chemical reduction were encountered with the (DPC) method for analyses of samples containing excesses of both Cr(III) and sulfide;

- "Environmental samples for Cr(VI) analyses should not be preserved by acidification to pH 2;

- "DPC reagent should be added to an alkaline sample before pH adjustment to 2 with sulfuric acid to minimize Cr(VI) reduction in the quantification step;

- "In the presence of oxidizing or reducing agents, the valence states of chromium species were not maintained in either (nitric acid or alkaline) digestion medium; the extent of the valence state conversion was dependent on the concentration of the specific oxidant or reductant added;

- "Cr(VI) spikes were reduced in municipal digested sludge (organic matrix), tannery sludge (organic/sulfide matrix), and NBS-SRM 1646 estuarine sediment;

- "Partial oxidation of Cr(III) spikes was observed for many samples (4 out of 8) in alkaline media; Cr(III) spikes were stable in electroplating sludge, tannery sludge (organic/sulfide matrix), NBS-SRM 1646 estuarine sediment and municipal digested sludge;

- "Partial oxidation of Cr(III) spikes in alkaline media produced measurement errors in Cr(VI) concentration by as much as 100 percent (positive bias)."

In view of the concern about environmental interconvertibility of chromium species, the LIA Laboratory undertook an investigation of CrVI fate in laboratory soil columns. This work encountered immediate difficulty with analytical methodology, which has been reported by Donmez and Kallenberger10). These findings led to more intensive study of CrVI analytical methods - work which is currently ongoing. Nazario and Menden11) have concluded that the methods studied were not directly applicable as published, but needed some modification or additional sample preparation to obtain reasonable results. They also found evidence that reagent chromium (III) nitrate solution contains small but significant levels of CrVI. This would suggest that chromic nitrate may not be suitable for preparation of CrIII standards, spikes or other valence-specific research needs. Chromic chloride solutions were free of CrVI and thus may be more suitable as CrIII standards.

Conclusions and Recommendations

With increasing frequency, tanners are being required to demonstrate the absence of CrVI in finished products, waste materials and waste disposal sites. This requires reliable techniques to extract and detect small quantities of CrVI (without valence alteration) from complex sample matrices in the presence of a large excess of CrIII as well as other potential interferents. This is by no means a simple task, and in a number of instances the official EPA methods are not entirely adequate as published. Too often, such work is performed by commercial laboratories with little or no experience in CrVI analysis and without even minimum quality assurance. The results as illustrated in the foregoing case histories, are often misleading and may have significant regulatory consequences. With tannery wastes, unvalidated false positive results are a source of particular concern.

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In view of these difficulties, we would offer the following recommendations for anyone undertaking hexavalent chromium analysis of tannery-related materials.

1. Both acid digestion (Method 3050) and alkaline digestion (Method 3060) of tannery samples are likely to cause valence change and are, therefore, to be avoided. For solid waste materials that cannot be analyzed directly, we can only recommend analysis of a neutral water extract. Although this method will not accurately quantify and may not even detect water-insoluble chromates (e.g. certain chromate pigments), it should not produce false positive or false high results from oxidation of CrIII, and should provide meaningful results for the more soluble and environmentally mobile forms of CrVI.

2. Coprecipitation (Method 7195) is difficult to perform and the results are quite sensitive to analytical technique. In addition, this method has proven unreliable (positive bias) where there is a substantial excess of CrIII (due to CrIII occlusion in the precipitate). Further rinsing only increases the likelihood some precipitate will be lost. Consequently, we cannot recommend this method for samples which are expected to be predominantly CrIII - including the majority of tannery-related materials.

3. Chelation/extraction (Method 7197) is relatively simple to perform and seems to be the preferred choice of independent commercial laboratories. The primary difficulty experienced with some and perhaps the majority of tannery wastes is the presence of organochromium III compounds that are directly soluble in MIBK without the chelation step and are therefore reported as CrVI. This method can be used satisfactorily, but only if additional verification steps are employed. The following procedure has been employed quite successfully at the LIA Laboratory:

   a. Verification of CrVI - Analyze a replicate sample in accordance with Method 7197 incorporating 1.0 ml of 50 mg/l L-ascorbic acid prior to pH adjustment (Section 7.3). If the result of this test is positive, it should be used as a blank and subtracted from the result obtained in the usual manner.

   b. Test for MIBK-Soluble Material - Analyze a second replicate sample in accordance with Method 7197 omitting the chelation step (Section 7.5). Proceed with MIBK extraction and determination of chromium concentration. (Standards for AA calibration can be made from chromium (III) acetylacetonate stock solution in 1-propanol diluted with MIBK). If the result of this test is positive, it should be equal to or smaller than the result obtained in step 3a above, and would suggest the presence of organochromium III compounds.

   c. Proceed with the additional verification step given in Section 7.10.

All sample analyses, blanks, spiked samples, etc. should be run in duplicate.

4. Colorimetric analysis (Method 7196) is perhaps the most reliable and sensitive method of the three, but there are a number of precautions that must be observed. These are summarized below:

   a. Since iron, tannins and other colored compounds may produce significant absorbence at 540 nm, it is essential to use matrix-matched blanks (without DPC/acetone) for all samples, including calibration standards

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and spiked samples.

b. If the spectrophotometer is zeroed using distilled water as prescribed in the published method, then an additional blank of water/DPC reagent in the same proportion as the actual sample should be run and subtracted from sample results. A simpler procedure is to zero the instrument using the water/DPC reagent blank.

c. DPC reagent deteriorates with age and should be prepared fresh for all analyses. A modified DPC reagent utilizing ethanol and phosphoric acid has been recommended by Bartlett and James5) and utilized quite successfully at the LIA Laboratory. Shelf life is improved if this is prepared with absolute alcohol.

d. Samples containing soil leachates tend to become turbid at pH 2, which can have significant effect on absorbence. The method (Section 7.0) suggests this can be corrected using a matrix-matched blank. We believe more reproducible results can be obtained by centrifuging both the blank and sample prior to absorbence readings.

e. Samples with high CrIII concentration may have sufficient color to make photometric readings difficult or impossible. In this case, it is necessary to first remove the CrIII by precipitation/filtration with Na_2CO_3 or NaOH at pH 8.5 - 9.0. The resulting precipitate must be carefully washed to remove any occluded CrVI. This technique has been used successfully by a number of laboratories.

f. All results should be verified as described in Section 7.3. In addition, we recommend use of the ascorbic acid technique described in step 3a above.

5. All three methods recommend using the method of standard additions "whenever a new sample matrix is being analyzed." This procedure should be mandatory for all tannery-related samples.

6. Whenever possible, replicate samples should be submitted to more than one testing laboratory and a portion retained for future reference. (Although the methods indicate samples should not be held more than 24 hours prior to analysis, retainer samples are still a wise precaution.) All analyses should be performed in duplicate and both results reported. To retard the chemical activity of hexavalent chromium, the methods direct that samples and extracts should be stored at 4°C until analyzed.

7. Independent commercial laboratories should be made fully aware of the potential errors and method weaknesses prior to undertaking CrVI determinations.

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3. Title 40, Code of Federal Regulations, Part 261.4 (b)(6)

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5. Bartlett, R. and James, B., Behavior of Chromium in Soils: III. Oxidation, J. Environ. Qual., Vol. 8, no. 1 (1979), 31

6. Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, 3rd Edition, U.S. EPA SW-846 (November 1986)

7. Tancous, Jean J., Skin, Hide and Leather Defects, Second Edition, Leather Industries of America Laboratory, University of Cincinnati (1986), p. 123

8. Menden, E.E and Rutland, F.H., Determination of Cr(VI) in Tannery Waste by the Chelation-Extraction Method, JALCA (in press)

9. Messman, J.D. et al., Determination of Stable Valence States of Chromium in Aqueous and Solid Waste Matrices - Experimental Verification of Chemical Behavior, Battelle Columbus Laboratories, U.S. EPA/600/54-86/039 (March 1987)

10. Donmez, L.A.H. and Kallenberger, W.E., Soil Leachate: Determination of Hexavalent Chromium, JALCA, 84, 110 (1989)

11. Nazario, C.L. and Menden, E.E., Comparative Study of Analytical Methods for Hexavalent Chromium, JALCA (in press)

COMMENT NUMBER: 8-D-2
DOCKET NUMBER: LD12-00146
COMMENTER: Leather Industries Research Laboratory
ISSUE: 8-Chromium (D007)
SUBISSUE: Total Chromium vs. Hexavalent and Trivalent Chromium
RESPONSE

The Agency thanks the commenter for providing comments on the proposed rule. The Agency received several objections in addition to the commenters objections to the proposal to regulate total chromium rather than hexavalent chromium in D007 and U032 wastes.

Although it is true that the Agency has concerns regarding the analytical difficulties associated with regulating hexavalent chromium, the Agency maintains that not only will treatment of total chromium provide the most effective treatment of hexavalent chromium, but it is long settled in the RCRA Subtitle C rules that EPA regulates on a total chromium basis unless a generator makes certain specific demonstrations as to the nature of the chromium in the waste, the type of process generating the waste, and the management regime to which the waste will be subject. See 40 CFR Part 261.4(b)(6)(i) (cited by the commenter). (To date, EPA is unaware of any generators filing such a demonstration to the Agency.) No persuasive reason has been offered to change this established regulatory system. Nor does EPA consider this issue to be reopened in this rulemaking.

Comment Number: 8-D-3
Docket Number: LD12-00158
Commenter: National Paint and Coatings Association, Inc.
Issue: 8-Chromium (D007)
Subissue: Total Chromium vs. Hexavalent or trivalent Chromium
Comment:

Chromium D007

EPA is proposing to regulate chromium in wastes as "total" chromium rather than distinguishing between the two valence states. The primary reason for this is due to the difficulty in analyzing treatment residues for hexavalent chromium. In 40 CFR 261.4 6(i) and (ii), EPA has distinguished between the toxicity chromium VI and chromium III. NPCA feels (believes) the Agency should be consistent in its approach to regulate chromium and should abandon its proposal to use total chromium as its standard for land disposal restriction. Land disposal treatability standards should be based on chromium VI to avoid confusion to the regulated community.

COMMENT NUMBER: 8-D-3
DOCKET NUMBER: LD12-00158
COMMENTER: National Paint and Coatings Inc. Assoc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Total Chromium vs. Hexavalent and Trivalent Chromium
RESPONSE

The Agency thanks the commenter for providing comments on the proposed rule. The Agency received several objections in addition to the commenters objections to the proposal to regulate total chromium rather than hexavalent chromium in D007 and U032 wastes.

Although the Agency continues to have concerns regarding the analytical difficulties associated with regulating hexavalent chromium, the Agency maintains that not only will treatment of total chromium provide the most effective treatment of hexavalent chromium, but it is long settled in the RCRA Subtitle C rules that EPA regulates on a total chromium basis unless a generator makes certain specific demonstrations as to the nature of the chromium in the waste, the type of process generating the waste, and the management regime to which the waste will be subject. See 40 CFR Part 261.4(b)(6)(i) (cited by the commenter). (To date, EPA is unaware of any generators filing such a demonstration to the Agency.) No persuasive reason has been offered to change this established regulatory system. Nor does the Agency consider this issue to be reopened by the comment. This issue has long since been settled in the 10-year old rulemaking.

Comment Number: 8-D-4

Docket Number: LD12-00272

Commenter: General Dynamics

Issue: 8- Chromium (D007)

Subissue: Total Chromium vs. Trivalent of Hexavalent Chromium

Comment:

On p. 48429 of the proposal, the EPA is proposing limits based solely upon the total metal content while ignoring the specific form of the metal in the waste. Our concern is primarily with chromium. While not attractive in any form, the toxicity of the hexavalent form is considerably higher than the trivalent form.

Past studies upon animals have shown that the most carcinogenic chromium compounds are the slightly soluble hexavalent compounds. Trivalent chromium is considerably less toxic and is neither irritating nor corrosive.

Likewise, trivalent chromium salts have little or no direct mutagenic activity in bacterial systems. It is the hexavalent form which is most readily absorbed by bacteria or cells. Once inside the cell it is reduced to the trivalent form where it is metabolically active and combines with the nucleic acids within the cell. Some have suggested that the causitive agent in chromium mutagenesis is trivalent chromium bound to genetic material after absorption and subsequent reduction of the hexavalent form.

Although more involved, there are methods to distinguish between trivalent and hexavalent chromium, such as automatic titration. With this in mind, the EPA should not base its treatment standard on the total metal concentration until such a time as epidemiological studies reveal a significant hazard of the trivalent form.

COMMENT NUMBER: 8-D-4

DOCKET NUMBER: LD12-00272

COMMENTER: General Dynamacs

ISSUE: 8-Chromium (D007)

SUBISSUE: Total Chromium vs. Hexavalent and Trivalent Chromium

RESPONSE

The Agency thanks the commenter for providing comments on the proposed rule. The Agency received several objections in addition to the commenters objections to the proposal to regulate total chromium rather than hexavalent chromium in D007 and U032 wastes.

The Agency maintains that not only will treatment of total chromium provide the most effective treatment of hexavalent chromium, but it is long settled in the RCRA Subtitle C rules that EPA regulates on a total chromium basis unless a generator makes certain specific demonstrations as to the nature of the chromium in the waste, the type of process generating the waste, and the management regime to which the waste will be subject. See 40 CFR Part 261.4(b)(6)(i). (To date, EPA is unaware of any generators filing such a demonstration to the Agency.) No persuasive reason has been offered to change this established regulatory system. Nor does the Agency consider this issue to be reopened by the comment. It has long since been settled in the 10-year old rulemaking.

Comment Number: 8-D-5
Docket Number: LD12-00253
Commenter: New Jersey's EPA
Issue: 8- Chromium (D007)
Subissue: Total Chromium vs. hexavalent or trivalent Chromium
Comment:

On page 48436, the Agency is proposing to regulate chromium in wastes as "total" chromium, rather than distinguishing between the trivalent and hexavalent cations, - primarily due to the difficulty in analyzing treatment residues for hexavalent chromium. However, the hexavalent state is of much more critical concern than the trivalent state. We feel that EPA should base BDAT standards on hexavalent chromium, in concert with an upgraded analytical procedure and a national RCRA laboratory certification program.

COMMENT NUMBER: 8-D-5
DOCKET NUMBER: LD12-00253
COMMENTER: New Jersey's EPA
ISSUE: 8-Chromium (D007)
SUBISSUE: Total Chromium vs. Hexavalent and Trivalent Chromium
RESPONSE

The Agency thanks the commenter for providing comments on the proposed rule. The Agency received several objections in addition to the commenters objections to the proposal to regulate total chromium rather than hexavalent chromium in D007 and U032 wastes.

Although the Agency still has concerns about the analytical difficulties associated with hexavalent chromium, the Agency maintains that not only will treatment of total chromium provide the most effective treatment of hexavalent chromium, but it is long settled in the RCRA Subtitle C rules that EPA regulates on a total chromium basis unless a generator makes certain specific demonstrations as to the nature of the chromium in the waste, the type of process generating the waste, and the management regime to which the waste will be subject. See 40 CFR Part 261.4(b)(6)(i). (To date, EPA is unaware of any generators filing such a demonstration to the Agency.) No persuasive reason has been offered to change this established regulatory system. Nor does the Agency consider this issue to be reopened by the comment. It has long since been settled in the 10-year old rulemaking.

Comment Number: 8-3-6
Docket Number: LD12-00274
Commenter: COLLIER, SHANNON & SCOTT
Issue: 8- Chromium (D007)
Subissue: Total Chromium vs. hexavalent or Trivalent Chromium
Comment:

4. **EPA should base the treatment standards for D007 wastewaters and K061 wastewaters on hexavalent, rather than total chromium.**

In the preamble to the proposed rule, EPA states that "the Agency is proposing to regulate chromium in wastes as 'total' chromium rather than distinguish between . . . valence state. This is primarily because of the difficulty in analyzing treatment residues for hexavalent chromium." 54 Fed. Reg. 48436. The adoption of total chromium for a treatment standard for D007 wastewaters and for K061 wastewaters is totally inappropriate and EPA's justification for this treatment standard is unfounded.[5]

Waste which contain exclusively (or nearly exclusively) trivalent chromium are not hazardous wastes. 40 C.F.R. § 261.4(b)(6). It is clear from the language of 40 C.F.R. § 261.4(b)(6) that hexavalent chromium is the pollutant parameter of concern. Therefore, we believe the land disposal restrictions should only address the treatment of hexavalent chromium and not total chromium. BDAT standards based on total chromium could require significant additional treatment to reduce trivalent chromium content which would be overly burdensome and yield no additional environmental benefit.

Attached to this document and marked as Exhibit A is Table 9 from the Lehigh Study on electric arc furnace dust. This Table demonstrates that only trace quantities of hexavalent chromium are present in electric arc furnace dust. Consequently, it is particularly inappropriate for EPA to set treatment standards for total chromium for K061 wastewaters.

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[5] EPA's establishment of BDAT standards on total chromium for analytical reasons is unjustified. Wastewaters can be readily analyzed for hexavalent chromium using either chelation/extraction (EPA solid waste method 7197) or spectrophotometry (method 7196).

Comment Number: 8-D-6 (Con't)
Docket Number: LD12- 00274
Commenter: COLLIER, SHANNON & SCOTT
Issue: 8 - Chromium (D007)
Subissue: Total Chromium vs. hexavalent or trivalent Chromium
Comment:

TABLE 9. - Forms of Chromium in Electric Furnace Dusts, weight-percent

Sample	Cr^{+6}	$*Cr^{+3}$	Total Cr	Sample	Cr^{+6}	$*Cr^{+3}$	Total Cr
0297....	<0.01	0.10	0.10	7294....	0.02	0.24	0.26
2299....	<0.01	0.49	0.49	7298....	0.13	9.97	10.1
4297....	<0.01	0.19	0.19	7299....	<0.01	0.06	0.06
4334....	0.16	4.28	4.44	7316....	<0.01	0.24	0.24
5308....	0.17	2.38	2.55	7316-S..	<0.01	0.23	0.23
5309....	0.03	0.36	0.39	7322....	<0.01	0.64	0.64
6300....	<0.01	0.17	0.17	8297....	0.03	2.15	2.18
6305....	0.02	0.17	0.19	8299....	0.02	0.20	0.22
6306....	<0.01	0.07	0.07	8316....	0.02	1.37	1.39
6313....	0.09	1.92	2.01	8317....	0.03	0.07	0.10
6314....	<0.01	0.15	0.15	8318....	<0.01	0.58	0.58
6317....	<0.01	0.13	0.13	8328....	0.01	1.52	1.53
6317-S..	<0.01	0.12	0.12	8329....	0.06	11.1	11.2
7273....	0.02	0.09	0.11	9320....	0.46	7.30	7.76
7274....	<0.01	0.05	0.05	9321....	0.21	7.88	8.09
7286....	0.01	0.01	0.02	9325....	0.04	0.38	0.42
7293....	<0.01	8.86	8.86	9344....	0.05	17.7	17.7

$*Cr^{+3}$ obtained by difference.

COMMENT NUMBER: 8-D-6

DOCKET NUMBER: LD12-00274

COMMENTER: Collier, Shannon & Scott

ISSUE: 8-Chromium (D007)

SUBISSUE: Total Chromium vs. Hexavalent and Trivalent Chromium

RESPONSE

The Agency thanks the commenter for providing comments on the proposed rule. The Agency received several objections in addition to the commenters objections to the proposal to regulate total chromium rather than hexavalent chromium in D007 and U032 wastes.

The Agency maintains that not only will treatment of total chromium provide the most effective treatment of hexavalent chromium, but it is long settled in the RCRA Subtitle C rules that EPA regulates on a total chromium basis unless a generator makes certain specific demonstrations as to the nature of the chromium in the waste, the type of process generating the waste, and the management regime to which the waste will be subject. See 40 CFR Part 261.4(b)(6)(i) (cited by the commenter). (To date, EPA is unaware of any generators filing such a demonstration to the Agency.) No persuasive reason has been offered to change this established regulatory system. Nor does the Agency consider this issue to be reopened by the comment. It has long since been settled in the 10-year old rulemaking.

Comment Number: 8 - D - 7
Docket Number: LD12 - 00276
Commenter: Specialty Steel Industry of the U.S.
Issue: 8 - Chromium (D007)
Subissue: Total Chromium vs. hexavalent or Trivalent Chromium
Comment:

EPA should base the treatment standards for D007 wastewaters and K061 wastewaters on hexavalent, rather than total chromium.

In the preamble to the proposed rule, EPA states that "the Agency is proposing to regulate chromium in wastes as 'total' chromium rather than distinguish between . . . valence state. This is primarily because of the difficulty in analyzing treatment residues for hexavalent chromium." 54 Fed. Reg. 48436. The adoption of total chromium for a treatment standard for D007 wastewaters and for K061 wastewaters is totally inappropriate and EPA's justification for this treatment standard is unfounded.[5]

Waste which contain exclusively (or nearly exclusively) trivalent chromium are not hazardous wastes. 40 C.F.R. § 261.4(b)(6). It is clear from the language of 40 C.F.R. § 261.4(b)(6) that hexavalent chromium is the pollutant parameter of concern. Therefore, we believe the land disposal restrictions should only address the treatment of hexavalent chromium and not total chromium. BDAT standards based on total chromium could require significant additional treatment to reduce trivalent chromium content which would be overly burdensome and yield no additional environmental benefit.

Attached to this document and marked as Exhibit A is Table 9 from the Lehigh Study on electric arc furnace dust. This Table demonstrates that only trace quantities of hexavalent chromium are present in electric arc furnace dust. Consequently, it is particularly inappropriate for EPA to set treatment standards for total chromium for K061 wastewaters.

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[5] EPA's establishment of BDAT standards on total chromium for analytical reasons is unjustified. Wastewaters can be readily analyzed for hexavalent chromium using either chelation/extraction (EPA solid waste method 7197) or spectrophotometry (method 7196).

COMMENT NUMBER: 8-D-7
DOCKET NUMBER: LD12-00276
COMMENTER: Speciality Steel Industry of the U.S.
ISSUE: 8-Chromium (D007)
SUBISSUE: Total Chromium vs. Hexavalent and Trivalent Chromium
RESPONSE

The Agency thanks the commenter for providing comments on the proposed rule. The Agency received several objections in addition to the commenters objections to the proposal to regulate total chromium rather than hexavalent chromium in D007 and U032 wastes.

The Agency maintains that not only will treatment of total chromium provide the most effective treatment of hexavalent chromium, but it is long settled in the RCRA Subtitle C rules that EPA regulates on a total chromium basis unless a generator makes certain specific demonstrations as to the nature of the chromium in the waste, the type of process generating the waste, and the management regime to which the waste will be subject. See 40 CFR Part 261.4(b)(6)(i). (To date, EPA is unaware of any generators filing such a demonstration to the Agency.) No persuasive reason has been offered to change this established regulatory system. Nor does the Agency consider this issue to be reopened by the comment. It has long since been settled in the 10-year old rulemaking.

Comment Number: 8-D-8
Docket Number: LD12-00179
Commenter: DOW
Issue: D007-CHROMIUM
Subissue: Total Chromium vs. Hexavalent or Trivalent Chromium
Comment:

The Agency is regulating "total" chromium in lieu of hexavalent chromium. This is an overly conservative approach. EPA has consistently recognized that only hexavalent chromium poses a substantial threat to human health and the environment. See, e.g., 45 Fed. Reg. 72,029 (October 30, 1980). EPA should not regulate total chromium and should adjust the level to reflect a standard of 5 mg/l of hexavalent chromium.

COMMENT NUMBER: 8-D-8
DOCKET NUMBER: LD12-00179
COMMENTER: DOW Chemical Co.
ISSUE: 8-Chromium (D007)
SUBISSUE: Total Chromium vs. Hexavalent and Trivalent Chromium
RESPONSE

The Agency thanks the commenter for providing comments on the proposed rule. The Agency received several objections in addition to the commenters objections to the proposal to regulate total chromium rather than hexavalent chromium in D007 and U032 wastes. For the final rulemaking the Agency is not distinguishing between chrome (III) and chrome (IV), but is promulgating treatment standards for total chromium at the characteristic level of 5.0 mg/l in the TCLP leachate for D007 nonwastewaters.

The Agency maintains that not only will treatment of total chromium provide the most effective treatment of hexavalent chromium, but it is long settled in the RCRA Subtitle C rules that EPA regulates on a total chromium basis unless a generator makes certain specific demonstrations as to the nature of the chromium in the waste, the type of process generating the waste, and the management regime to which the waste will be subject. See 40 CFR Part 261.4(b)(6)(i). (To date, EPA is unaware of any generators filing such a demonstration to the Agency.) No persuasive reason has been offered to change this established regulatory system. Nor does the Agency consider this issue to be reopened by the comment. It was settled in the 10-year old rulemaking.

Comment Number: 8-D-9
Docket Number: LD12-00159
Commenter: WASTE MANAGEMENT, INC., CHEM WASTE MANAGEMENT
Issue: 8- CHROMIUM (D007)
Subissue: TOTAL Chromium vs. Hexavalent and Trivalent Chromium
Comment:

Since the universe of D007 wastes includes wastes containing both trivalent and hexavalent chromium, setting a treatment standard for these wastes based on K062, which contains only trivalent chromium, is inappropriate. Instead, the treatment standard should be based on a waste containing hexavalent chromium.

COMMENT NUMBER: 8-D-9

DOCKET NUMBER: LD12-00159

COMMENTER: Waste Management, Inc., Chem Waste Management

ISSUE: 8-Chromium (D007)

SUBISSUE: Total Chromium vs. Hexavalent and Trivalent Chromium

RESPONSE

For the final rulemaking the Agency is withdrawing the proposed D007 treatment standard based on K062 data. The Agency received many comments indicating that the K062 data are not representative of the "Universe" of D007 wastes. Consequently the Agency reviewed the comment and treatment performance data and was able to determine that a treatment standard of 0.74 mg/l TCLP was achievable for D007 nonwastewaters. However, the Agency is aware that D007 waste are extremely diverse, and is therefore promulgating a treatment standard of 5.0 mg/l in the TCLP leachate for D007 nonwastewater and 5.0 mg/l total concentration for D007 wastewaters.

The Agency maintains that not only will treatment of total chromium provide the most effective treatment of hexavalent chromium, but it is long settled in the RCRA Subtitle C rules that EPA regulates on a total chromium basis unless a generator makes certain specific demonstrations as to the nature of the chromium in the waste, the type of process generating the waste, and the management regime to which the waste will be subject. See 40 CFR Part 261.4(b)(6)(i). (To date, EPA is unaware of any generators filing such a demonstration to the Agency.) No persuasive reason has been offered to change this established regulatory system. Nor does the Agency consider this issue to be reopened by the comment. It was settled in the 10-year old rulemaking.

Comment Number: 8-D-10

Docket Number: LD12-00200

Commenter: FERROALLOYS ASSOCIATION

Issue: 8-Chromium (D007)

Subissue: Total Chromium vs. Hexavalent vs trivalent chromium

Comment:

EPA proposes a level two orders of magnitude below the EP Toxicity criterion of 5.0 not for hexavalent chromium, but for total chromium. EPA's rationale, stated on page 54 Fed. Reg. 48436-7, is that measuring the residues of wastewater treatment for hexavalent chromium is difficult. EPA's proposal penalizes wastes that may contain little or no hexavalent chromium. For example, the Ferroalloys wastes designated by EPA as K090 and K091 contain varying amounts of hexavalent chromium, all below 1% of the total chromium fraction. See attachment, submitted to EPA on June 30, 1981. With this kind of knowledge of the constituents of the waste matrix, it is unjustifiable to use analytical complexity as a basis for penalizing wastes in which chromium is almost exclusively in the trivalent state. In any case, this issue would not arise if EPA recognized that the EP Toxicity criterion (which is stated in terms of total chromium) sets the floor for BDAT treatment standards.

Comment Number: 8-E-1
Docket Number: LD12-00266
Commenter: Penberthy Electromelt Int. Inc.,
Issue: 8- Chromium (D007)
Subissue: Miscellaneous (Use of a pretreatment step is uncessary)
Comment:

Page 48430, col. 2-3. Using suitable electric melting technology there is no need for a pretreatment step to reduce hexavalent chromium. This is fully soluble in glass, making it green (e.g. Seven-Up beverage bottles).

COMMENT NUMBER: 8-E-1
DOCKET NUMBER: LD12-00266
COMMENTER: Penberthy Electromelt International, Inc.
ISSUE: 8-Chromium (D007)
SUBISSUE: Miscellaneous (use of a pretreatment step) on
RESPONSE: hexavalent chromium)

In today's rulemaking the Agency is promulgating concentration-based treatment standards of 5.0 mg/l in the TCLP leachate (the characteristic level) for D007 nonwastewater and 5.0 mg/l total concentration for D007 wastewaters.

Since the Agency is promulgating a concentration-based treatment standard, facilities are not precluded from using other technologies in meeting the treatment standard.

Comment Number: 8-E-2
Docket Number: LD12-L0024
Commenter: DOW CHEMICAL USA
Issue: 8-Chromium (D007)
Subissue: Miscellaneous (Dismantling of a facility that
Comment: contained chromium waste)

Allied-Signal Inc. officials and their counsel explained that the Baltimore Works facility on a 17 acre peninsula in Baltimore's Inner Harbor had been operating for 140 years prior to its shutdown in 1985. A September 1989, Consent Decree (United States of America, State of Maryland and Allied-Signal Inc.) includes the dismantlement plan. Work to dismantle various buildings and their machinery/facilities was to begin in January 1990, lasting for three years.

Contamination was due to the construction and operation of the facility. For example, some of the facilities had dirt floors and were built using transite, an asbestos containing material. In the manufacturing process chrome ore was converted into hexavalent chromium compounds(chromeVI). ChromeVI permeated cement, brick, leachate cars used to roast the ore and steel piping in the production plant.

DISMANTLEMENT/DISPOSAL/REMEDIATION PLAN

The officials explained that the plan is to dismantle above ground facilities by first segregating asbestos and/or chrome VI contaminated material and mechanically scraping or high pressure water cleaning other materials with surface contamination(waste minimization). They estimate 42,000 tons of debris will be generated at the site of which 29,000 is not or will no longer be contaminated. However, 13,000 tons(plus or minus 20%) is expected to be contaminated with ChromeVI-some of which may also contain asbestos.

They plan to dispose of 10,000 tons of ChromeVI contaminated debris in the Maryland run RCRA facility at Hawkins Point near the site. They plan to truck the remaining 3,000 tons of contaminated debris to commercial hazardous waste disposal facilities(mentioned were those in Ohio and Michigan) at a cost of $200. to $250. a ton. Because of these costs, they said they were offering their dismantlement contractor incentives to decontaminate as much debris as possible.

The disposal plan is confounded by both the LDR and the fact that the Hawkins Point facility is not a minimum technology requirement (MTR) hazardous waste landfill. If they cannot use Hawkins Point, they estimate 500 truckloads of contaminated waste would be transported out of state.

They plan an onsite wastewater treatment facility. They do not expect any problems from the treatment and disposal of residuals.

Comment Number: 8- E-2 (con't)
Docket Number: LD12- L0024
Commenter: DOW CHEMICAL
Issue: 8- Chromium (D007)
Subissue: Miscellaneous (Dismantling of a facility that contained chromium waste)
Comment:

Lastly, they do not plan to remove any contaminated soil. Instead, they plan to build a slurry wall and cap the site.

LDR PROPOSED RULE WOULD NOT ALLOW ALLIED-SIGNAL TO FOLLOW THEIR DISMANTLEMENT PLAN

The officials noted that under the proposed rule, the chromeVI contaminated debris would be classified as D007 nonwastewater (regulated by BDAT treatment standard-TCLP .094mg/l for any single grab sample based on chromium reduction and lime or sulfide precipitation and sludge dewatering). They also noted that EPA did not propose a national capacity variance for this waste.

They said some of the material they tested is thoroughly contaminated with chromeVI and cannot be surface treated satisfactorily. In time the absorbed chromeVI will come to the surface. They said the bulk material could range up to 500-800ppm chromeVI and does not pass any proposed leaching tests. Because of the physical form of the material, they know of no currently available technology to reduce the chromeVI in these wastes. They surveyed all commercial facilities that handle nonwastewater chromeVI wastes. None would take or could treat this contaminated debris to proposed treatment standards. They reported that commercial facilities accepting soils and sludges can not treat particles larger than one inch.

The officials said our use of the word debris seems to apply to below grade waste and not to above ground dismantlement debris. They noted difficulty even in preparing a sample for testing(9mm sieve). They stated categorically that this was not analogous to K062 and/or F006 wastes.

Furthermore, they were concerned that because of the storage prohibitions in the LDR they could not even begin the project (segregating the debris prior to disposal).

COMMENT NUMBER: 8-E-2
DOCKET NUMBER: LD12-L0024
COMMENTER: DOW Chemical Co. USA
ISSUE: 8-Chromium (D007)
SUBISSUE: Miscellaneous (dismantling of a facility that
RESPONSE contained chromium wastes)

The concerns expressed by the commenter are being addressed through the treatability variance process.

On February 14, 1990, Allied Signal Inc. petition the Administrator for a variance from the treatment standard. On April 17, 1990, EPA published in the Baltimore Sun a public practice of EPA's intend to grant Allied Signal, Inc. a site specific variance from the treatment standard. EPA expects to respond to Allied's concerns in a final decision on their treatability variance requests at the time the Third Third is promulgated, or shortly thereafter.

Comment Number: 8-F-1
Docket Number: LD12-L0031
Commenter: Thermal KEM / CyanoKEM
Issue: 8- Chromium (D007
Subissue: Comments on Data for (D007)
Comment:

COMMENTS ON DATA RELATED TO D007 WASTE

A. CyanoKEM Comments on Allied-Signal, Inc. Comments on Application of Land Disposal Restriction for Third Schedules Wastes (54 Fed. Reg. 48372) to D007-Contaminated Dismantlement Debris

CyanoKEM agrees with "Allied's" comments regarding D007-contaminated debris in that a treatment standard of 0.094 mg/L chromium in the non-wastewater residue TCLP extract is unachievable. In fact, CyanoKEM petitioned EPA in September 1989 (following promulgation of the second third land-disposal restrictions) for a site specific treatment variance, from the F006 non-wastewater BDAT standards, for disposal of decontaminated debris at approved hazardous waste land disposal facilities. Much of the debris CyanoKEM decontaminates and treats is the same type of contaminated dismantlement material (i.e., bricks, concrete, steel structures and piping, etc.) that Allied is referring to in their comments.

In its treatment variance petition, CyanoKEM has demonstrated by treatability tests, that a more appropriate treatment standard for decontaminated debris is a TCLP extract concentration of about 24 mg/L total chromium. The basic reason that the F006 BDAT standard of 5.2 mg/L chromium (or any lower concentration) cannot be achieved is that these type of materials cannot be "stabilized" (as wastewater treatment sludges can be) by current chemical stabilization technologies.

In addition to chromium, CyanoKEM also demonstrated in its September 1989 Site Specific Treatment Variance Petition for Debris (requested per 40CFR268) that the existing non-wastewater treatment standards for nickel, cadmium, lead and silver cannot be achieved for the same reason.

With regard to capacity, CyanoKEM agrees that there is probably insufficient capacity to treat 42,000 tons of chromium contaminated debris waste in a reasonable time at an offsite facility subject to the BDAT standard. However, EPA should consider the possibility that this material could be treated on-site. Several firms are

Comment Number: 8-F-1 (Cont)
Docket Number: LD12-L0031
Commenter: Thermal KEM/CyanoKEM
Issue: 8-Chromium (D007)
Subissue: Comment on D007 data
Comment:

engaged in the business of supplying mobil treatment technologies for such purpose. Such work has been conducted on EPA sponsored cleanups. The on-site treatment option should be evaluated for this project. In addition, if EPA revised the interpretation of the derived-from rule with regard to scrap metal debris waste, the capacity issue would not be significant, particularly if an approach were taken similar to the empty container rule under 261.7 as proposed by the HWTC comments. This would also simplify on-site decontamination of debris.

Finally, CyanoKEM has since commented to EPA in December 1989 (concerning publication of the proposed third scheduled land disposal regulation (54 Fed. Reg. 48372) that we find the 0.094 mg/L chromium standard for non-wastewater TCLP extract from D007 treatment residue is unachievable due to the characteristic high levels of chromium and other high solids in these waste streams. These comments were made in reference to land disposal of chemically "stabilized" wastewater treatment sludges and filter cakes. Therefore, a treatment standard of 0.094 mg/L chromium for debris contaminated with D007 would also be unachievable even if it could be stabilized by conventional chemical stabilization methods.

We support raising the proposed chromium BDAT standard for non-wastewaters from the proposed level of .094 PPM to a level of 0.3 to 0.7 PPM. Justification has also been provided in our previous comments as to why the tech transfer from K062 is inappropriate for D007 (See Docket Document #LD12-00020).

Other commenters supporting this, are listed below:

- Allied/Signal Corporation
- Chemical Manufacturers Association (Docket #00187)
- Tricil
- Chemfix
- Eticam
- CyanoKEM (Docket #00020)
- Steel Manufacturers Association
- American Chrome and Chemicals (Docket #00105)
- Phillips Petroleum Company (Docket #00086)
- HWTC (Docket 00050 and 00067)

Comment Number: 8-F-1 (end)
Docket Number: LD12-L0031
Commenter: Thermal KEM/CyanoKEM
Issue: 8-Chromium (D007)
Subissue: Comments on D007 data
Comment:

The CMA comments on metal catalyst waste points out one of their member companies who provided 54 data points. Forty two of these data points (or 78%) were below a level of 1 PPM. Although we support CMA on raising the .094 chromium standard, both our data and their data do not support raising the BDAT standard above 1 PPM.

COMMENT NUMBER: 8-F-1
DOCKET NUMBER: LD10-L0031
COMMENTER: ThermalKEM/CyanoKEM
ISSUE: 8-Chromium (D007)
SUBISSUE: Comments on Data for D007
RESPONSE

The Agency received comments requesting that the Agency verify the appropriate treatment for characteristic metal wastes that are identified as slags, glass, concrete, bricks, and other inorganic solid debris. The Agency agrees that these, as well as other similar wastes, form a different treatability group, and is identifying this group of D004 through D001 wastes as the "inorganic solids debris" treatability group. Waste in this treatability group are defined in Section 268.2(a)(7) of today's rule.

While the Agency is establishing a separate treatability group for these "inorganic solids debris," it is promulgating the same concentration-based treatment standard for these wastes as for other characteristic metal wastes. Thus, there are no separate treatment standards for inorganic solids debris D004 through D011 wastes appearing in today's rule. The Agency has determined, however, that there is a national capacity shortage for treatment of this treatability group. Therefore, the standards for D004 through D001 wastes do not apply to inorganic solids debris until May 8, 1992. For further details on this issue, see today's final rulemaking Federal Register Notice.

EPA has reviewed the D007 performance data submitted to the Agency during the comment period and has determined that the proposed treatment standard of 0.094 mg/l for D007 nonwastewaters may not be routinely achievable for all forms of D007 nonwastewaters.

COMMENT NUMBER: 8-F-1 (continued)
DOCKET NUMBER: LD10-L0031
COMMENTER: ThermalKEM/CyanoKEM
ISSUE: 8-Chromium (D007)
SUBISSUE: Comments on Data for D007
RESPONSE

The treatment performance data submitted by the commenter and the Hazardous Waste Treatment Council (these two data sets were less deficient in information than other data submitted during the comment period) indicated that a treatment standard of 4.3 mg/l may be more routinely achievable for D007 nonwastewaters.

The HWTC data (LD12-0050) contained 42 data points from which only 10 data points contained the untreated and corresponding treated TCLP data (this was determined from review of Table II and Attachment I of HWTC's data under Docket number LD12-00050). As mentioned above, only 10 data points from HWTC's data contained untreated and corresponding treated TCLP values, so the Agency calculated a standard of 0.74 mg/l based on these data. However, the HWTC's data contained an additional 32 incomplete treatment data points (no TCLP analyses for the untreated waste). Many of these data points could not meet the 0.74 mg/l treatment standard based on the 10 data points from HWTC or the 0.86 mg/l treatment standard based on 10 data points submitted by the commenter. Assuming that these additional 32 data points from HWTC represent valid treatment, the Agency decided that both the 0.86 mg/l and the 0.74 mg/l D007 nonwastewater standards calculated on just 20 data points were not routinely achievable. The Agency found that it was difficult to ascertain (per treatment facility) the mixing ratios of waste volumes that were received from each of the different industries. While the data received to the record indicate that some waste contained very high concentrations of chromium, the lack of information on mixing ratios and feed rates make it difficult to assess the true effectiveness of treatment (i.e., the Agency could not determine the chromium concentration of the mixed D007 waste prior to treatment).

COMMENT NUMBER: 8-F-1 (continued)
DOCKET NUMBER: LD10-L0031
COMMENTER: ThermalKEM/CyanoKEM
ISSUE: 8-Chromium (D007)
SUBISSUE: Comments on Data for D007
RESPONSE

The Agency points out that the data from CyanoKEM represented primarily treatment of liquid wastes (some with very high concentrations of chromium). Some of the sludges generated from this process did not require further treatment (i.e., stabilization). This same situation occurred in generating the promulgated treatment standards for K062 wastes, in that the wastewater treatment process employed for treating the combined K062/D007 wastes was effective enough that the treatment sludges were not characteristic for chromium and did not require any further stabilization. (Thus, the derivation of the 0.094 mg/l proposed standard for D007 nonwastewaters.) While the commenter's data clearly indicated that the proposed treatment standard of 0.094 mg/l could not be achieved and thus implying that their combined D007 wastes were more difficult to treat, their data did not represent wastes similar to those represented by the HWTC data which was comprised primarily of sludge stabilization data.

As a result of these comments and data, EPA is withdrawing both of the proposed treatment standards for D007 wastes (i.e., the transfer from K062 and from F006). The Agency contemplated promulgating the 5.2 mg/l F006 standard, which it is even closer to the characteristic level than the 4.3 mg/l calculated using the commenters' data (i.e., the commenter's data and 42 data points from HWTC). The treatment standard promulgated today, therefore, is set at 5.0 mg/l chromium (total) (as measured by TCLP). While the majority of commenters supported this approach from a policy standpoint, the Agency is convinced that the available data submitted by them clearly indicate the validity of the achievability of this standard.

COMMENT NUMBER: 8-F-1 (continued)
DOCKET NUMBER: LD10-L0031
COMMENTER: ThermalKEM/CyanoKEM
ISSUE: 8-Chromium (D007)
SUBISSUE: Comments on Data for D007
RESPONSE

The commenter pointed out that other commenters supported the position that the proposed treatment standard of 0.094 mg/l for D007 nonwastewaters should be raised. The Agency acknowledges that it is true that the commenters (identified below) all believed that the proposed standard of 0.094 mg/l for D007 nonwastewaters was unachievable. However, the commenter and HWTC were the only commenters who believed that the D007 nonwastewater standard should be in the range of 0.3 to 0.7 mg/l. The following is a summary of the positions held by the other commenters referred to above.

Tricil Corporation submitted comments and D007 treatment data under Docket Number LD12-00094. Tricil stated that the D007 nonwastewater standard should be 5.2 mg/l based on the F006 treatment data. The Agency notes that Tricil, a member of the treatment industry, rejects certain waste streams because they are believed to be untreatable due to the presence of complexing agents and high concentrations of chromium in excess of 10,000 ppm. Although these data were lacking in information, if they were used to calculate a treatment standard it would have been 12 mg/l for D007 nonwastewaters.

Chemfix submitted comments and treatment data (LD12-00073) for D007 wastes. Chemfix stated that the proposed D007 nonwastewater standard could not be routinely achieved, but believes that a standard below 5.2 could be achieved. Although these data were deficient in information, if they were used to calculate a standard it would have been 0.33 mg/l. (The Agency notes that this standard is based on only one datum point with untreated concentrations of only 17.9 mg/kg.)

COMMENT NUMBER: 8-F-1 (continued)
DOCKET NUMBER: LD10-L0031
COMMENTER: ThermalKEM/CyanoKEM
ISSUE: 8-Chromium (D007)
SUBISSUE: Comments on Data for D007
RESPONSE

Eticam submitted comments (no treatment data) under Docket Number LD12-00270. Eticam stated that the proposed D007 nonwastewater standard of 0.094 mg/l is not achievable and that a standard 5.2 mg/l is difficult to achieve in some instances.

Phillips Petroleum submitted comments (no treatment data) under LD12-00080. Phillips Petroleum stated that the proposed D007 nonwastewater standard was unachievable and the Agency should set a standard of 5.2 mg/l based on the F006 data.

American Chrome and Chemical Inc. submitted comments under LD12-00105. American Chrome and Chemicals Inc. stated that D007 nonwastewaters should not be regulated below the characteristic level for chromium, i.e., 5.0 mg/l (TCLP leachate).

Chemicals Manufacturers Association (CMA) submitted comments and treatment data for D007 wastes. CMA stated that the 0.094 mg/l is unachievable and the D007 nonwastewater standard should be based on F006 data, i.e., 5.2 mg/l. The CMA data were deficient in criteria meeting the BDAT data quality; however, if these data were used to calculate a standard, the data would have produced a standard of 20 mg/l.

COMMENT NUMBER: 8-F-1 (continued)
DOCKET NUMBER: LD10-L0031
COMMENTER: ThermalKEM/CyanoKEM
ISSUE: 8-Chromium (D007)
SUBISSUE: Comments on Data for D007
RESPONSE

Finally, with respect to the Chemical Manufacturers Association data, these data were deficient in many criteria for BDAT data quality, i.e., no untreated data (total or TCLP) and no Quality Assurance/Quality Control (QA/QC) information. Although these data do not meet the criteria for BDAT quality, if they were used to develop a treatment standard it would be 20 mg/l before correction factors are applied. Based on the data and comments discussed above, the Agency does not believe, as the commenter does, that this is supportive of keeping the D007 standard below 1 ppm.

Comment Number: 8-F-2
Docket Number: LD12-L0032
Commenter: COVINGTON & BURLING
Issue: 8- Chromium (D007)
Subissue: Comments on D007 data
Comment:

D007 Treatment Data

Tricil Environmental Services, Inc., Chemfix Environmental Services, Inc., and Waste Management, Inc. submitted data on the treatability of D007 nonwastewaters. All three sets of data demonstrate that the proposed treatment standard of 0.094 mg/L is not achievable by all or even most D007 nonwastewaters.

For example, the Tricil data includes samples with concentrations of chromium up to 4.66 mg/L after treatment. Part of the Chemfix data indicates that waste containing less than 20 mg/kg of chromium can be treated to a level of 0.12 mg/L. The rest of the Chemfix data indicates that other D007 wastes cannot be treated to such low levels. Finally, the Waste Management data indicates that no non-listed (characteristic) D007 wastes can be treated to the Agency's proposed treatment level of 0.094 mg/L. See Waste Management Comments at Attachment H.

This data, based on actual D007 nonwastewaters, indicates that a treatment standard of 0.094 mg/L is not possible for most wastes in this treatability group. Thus, the Agency cannot claim that its proposed standard is "demonstrated." For this reason, EPA should rely on the Tricil, Chemfix and Waste Management data, not the K062 waste data relied upon by EPA in its D007 Background Document, to establish the treatment standard for D007 nonwastewaters.

Please note, however, that even the D007 treatment data submitted by these three waste treatment companies do not represent the universe of D007 nonwastewaters. For example, in its comments, Tricil states that, although it accepts only liquid wastes, it still must reject some chrome streams as untreatable due to the presence of complexing agents and the concentration of chrome. See Tricil Comments at ¶ 6. The Chemfix data is based on treatment of K048 incinerator residue. Finally, the nonlisted wastes included in the data submitted by Waste Management are incinerator residues, evaporator still bottoms, non-F006 metal finishing waste, paint booth waste, lead smelter residues, jet fuel treating clay and contaminated soils. See Waste Management Comments at 94.

Comment Number: 8-F-2 (Con't)
Docket Number: LD12-L0032
Commenter: COVINGTON & BURLING
Issue: 8-Chromium (D007)
Subissue: Comments on Chromium data
Comment:

Indeed, the data submitted by Waste Management supports the point made by OCF in its comments on the Third Third Land Ban proposed rule: the treatability group of D007 nonwastewaters includes wastes which cannot be treated by stabilization, the technology identified as BDAT for D007 nonwastewaters. For example, Attachment G of the Waste Management comments includes two D007 wastes that could not be treated because Waste Management could not break up the pieces or grind them up sufficiently to render them suitable for stabilization. This is also true of OCF's D007 nonwastewaters, see OCF Comments at Attachment A, and many items of debris, including D007 debris, that are sent to Waste Management for disposal, see Waste Management Comments at Attachment A (waste profile V94942 appears to be very similar to D007 nonwastewaters generated by OCF).

The Agency should use this data to create a subcategory of D007 nonwastewaters which cannot be treated with stabilization technologies. This subcategory could be defined as D007 nonwastewaters containing greater than 10% by volume solids exceeding 9.5mm sieve size. Cf. 54 Fed. Reg. at 48,489. The Agency should then establish a two-year national capacity variance for this subcategory. Alternatively, the Agency could expand the proposed two-year national capacity variance for contaminated soil and debris for which the proposed treatment standards are based on combustion, wet-air oxidation, virtrification, or mercury retorting, see id., to include soil and debris for which the proposed treatment standards are based on stabilization. A variance is necessary because many D007 nonwastewaters, including that which can be characterized as debris, cannot be stabilized. See Waste Management Comments at 43. Furthermore, even though some D007 nonwastewaters can be treated with high temperature metals recovery, this treatment also requires size reduction which is not available at a sufficient number of facilities to be considered commercially available to any generator.

COMMENT NUMBER: 8-F-2
DOCKET NUMBER: LD12-L0032
COMMENTER: Covington & Burling
ISSUE: 8-Chromium (D007)
SUBISSUE: Comments on D007 Data
RESPONSE

The Agency shares the same concerns that much of the data submitted during the comment period failed to achieve the proposed treatment standard of 0.094 mg/l (TCLP leachate concentration) for D007 nonwastewaters. Although these data were lacking in some information (discussed in detail in the final BDAT Background Document for Chromium Wastes D007 and U032) these data are suggested of the difficulties in treating chromium waste and the variety of wastes included under the D007 waste code. The Agency noted that the Tricil data showed a treated range of less than 0.1 to 4.9 mg/l, and Tricil stated that some chromium waste stream are rejected for treatment at their facility due to the presence of complexing agents. The Agency also noted that the data from Waste Management indicated that there were difficulties in treating one particular waste stream, i.e., the chromic acid sludge.

The Agency agrees with the commenter's suggestion to establish a separate subcategopry for inorganic D007 nonwastewater debris that cannot be treated due to the physical and chemical characteristics of these types of waste. In today's final rulemaking, the Agency is establishing a separate treatability group to include refractory bricks, for these "inorganic solid debris." EPA is promulgating the same concentration-based treatment standards for these wastes as for other characteristic metal waste. Thus, there are no separate treatment standards for inorganic solids debris D007 wastes appearing in today's rule. (The Agency did not receive treatment performance data meeting the BDAT

COMMENT NUMBER: 8-F-2 (continued)
DOCKET NUMBER: LD12-L0032
COMMENTER: Covington & Burling
ISSUE: 8-Chromium (D007)
SUBISSUE: Comments on D007 Data
RESPONSE

criteria for data quality to support an alternative treatment standard for these wastes.) Therefore, the standards for D007 wastes do not apply to inorganic solids debris until May 8, 1992. For further details on this issue see Section III.A.3.(a)(2) of today's final Third Third Rule.

Comment Number: 8-F-3
Docket Number: LD12-L0034
Commenter: HWTC
Issue: 8- Chromium D007
Subissue: comments on D007 data
Comment:

G. Comments On Chromium Waste (D007)

The HWTC supports raising the proposed chromium BDAT standard for non-wastewaters from the proposed level of .094 PPM to a level of 0.3 to 0.7 PPM. Two of our member companies provided extensive data supporting this increase. Justification has also been provided in our commentary as well as our members as to why the tech transfer from K062 is inappropriate for D007.

Other data comments supporting this approach are listed below:

- Allied/Signal Corporation
- Chemical Manufacturers Association (Docket #00187)
- Tricil
- Chemfix
- Eticam
- CyanoKEM (Docket #00020)
- Steel Manufacturers Association
- American Chrome and Chemicals (Docket #00105)
- Phillips Petroleum Company (Docket #00086)

The CMA comments on metal catalyst waste, and points out one of their member companies who provided 54 data points. Forty two of these data points (or 78%) were below a level of 1 PPM. Although we support CMA on raising the .094 chromium standard, both our data and their data do not support raising the BDAT standard above 1 PPM.

The comments submitted by HWTC for one of our member companies regarding chromium data (Docket No. 00067) contains 42 data points on chromium in nonwastewater treatment residuals. To prevent any possible misinterpretation of this data we must point out that all 42 data points should not be combined for the purpose of calculating BDAT, since two treatability tests are performed for each data point, to illustrate the degree achieved using different mixtures of treatment reagents. The lowest of each of the 21 data pairs, which reflects the best treatment "recipe" of regents, should be combined to show the degree of treatment achievable.

If this is done, the BDAT calculated based on this data set is 2.1 ppm even after variability factors are included. The table below indicates the data from this submittal that should be used in calculating a BDAT treatment standard. The purpose of providing the other set of data points was merely to contrast the levels of achievable treatment based on differing levels of reagents.

Comment Number: 8-E-3 (Con't)
Docket Number: LD12-L0034
Commenter: HWTC
Issue: 8- Chromium (D007)
Subissue: Comments on D007 data
Comment:

HWTC DATA - TCLP CHROMIUM RESULTS FOR OPTIMUM STABILIZED FORMULATIONS DOCKET NUMBER LDR-00050 and 00067

Data Point		TCLP (mg/l)		ln
1		4.54		1.5129
2		1.38		0.3221
3		0.052		-2.9565
4		0.01		-4.6052
5		0.081		-2.5133
6		0.08		-2.5257
7		0.052		-2.9565
8		0.06		-2.8134
9		0.08		-2.5257
10		0.009		-4.7105
11		0.06		-2.8134
12		0.01		-4.6052
13		0.26		-1.3471
14		0.052		-2.9565
15		0.07		-2.6593
16		0.052		-2.9565
17		0.1		-2.3026
18		0.22		-1.5141
19		0.1		-2.3026
20		0.06		-2.8134
21		0.052		-2.9565
22		0.08		-2.5257
	Mean	0.3391	y	-2.5239
	Std. Dev.	0.9802	Sy	1.4066

VF = 6.265
Treatment Standard = Mean x VF = 0.3391 x 6.265 = 2.12 mg/l

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Comment:

Finally, another data submittal by another HWTC member, CyanoKEM (Docket No. 00020), presented chromium data also. The table below summarizes the BDAT calculated on the basis of this data:

BDAT BASED ON CYANOKEM DATA SUBMITTAL

DOCKET NO. LD12-00020

Number of Data Points	10
Mean	0.151 mg/l
Standard Deviation	0.830
Variability Factor	4.898
BDAT Standard	0.74 mg/l

The data package submitted by CyanoKEM can be referred to for more details.

Therefore both data sets support that treatment below the characteristic level is achievable, and supports final BDAT standard for chromium in nonwastewater treatment residuals below the characteristic level.

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RESPONSE

EPA has reviewed the D007 performance data submitted to the Agency during the comment period and has determined that the proposed treatment standard of 0.094 mg/l for D007 nonwastewaters may not be routinely achievable for all forms of D007 nonwastewaters.

The treatment performance data submitted by the commenter and CyanoKEM Corporation (these two data sets were less deficient in information than other data submitted during the comment period) indicated that a treatment standard of 4.3 mg/l may be more routinely achievable for D007 nonwastewaters.

The commenter's data (under Docket number LD12-00050) contained 42 data points from which only 10 data points contained the untreated and corresponding treated TCLP data (this was determined from review of Table II and Attachment I of LD12-00050). The commenter requested that only the lowest values i.e., 21 data points (representing the best treatment from the use of different mixtures of reagents) be used to calculate a treatment standard. As mentioned above, only 10 data points from the commenter's data contained untreated and corresponding treated TCLP values, so the Agency calculated a standard of 0.74 mg/l based on these data. However, the commenter's data contained an additional 32 incomplete treatment data points (no TCLP analyses for the untreated waste). Many of these data points could not meet the 0.74 mg/l treatment standard based on the 10 data points from HWTC or the 0.86 mg/l treatment standard based on 10 data points submitted by CyanoKEM Corporation. Assuming that these additional 32 data points (from the commenter's data)

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represent valid treatment, the Agency decided that both the 0.86 mg/l and the 0.74 mg/l standards calculated on just 20 data points were not routinely achievable. The Agency found that it was difficult to ascertain (per treatment facility) the mixing ratios of waste volumes that were received from each of the different industries. While the data received to the record indicate that some waste contained very high concentrations of chromium, the lack of information on mixing ratios and feed rates make it difficult to assess the true effectiveness of treatment (i.e., the Agency could not determine the chromium concentration of the mixed D007 waste prior to treatment).

The Agency points out that the data from CyanoKEM represented primarily treatment of liquid wastes (some with very high concentrations of chromium). Some of the sludges generated from this process did not require further treatment (i.e., stabilization). This same situation occurred in generating the promulgated treatment standards for K062 wastes, in that the wastewater treatment process employed for treating the combined K062/D007 wastes was effective enough that the treatment sludges were not characteristic for chromium and did not require any further stabilization. (Thus, the derivation of the 0.094 mg/l proposed standard for D007 wastes.) While CyanoKEM's data clearly indicated that the proposed 0.094 mg/l standard could not be achieved and thus implying that their combined D007 wastes were more difficult to treat, their data did not represent wastes similar to those represented by the HWTC data which was comprised primarily of sludge stabilization data.

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As a result of these comments and data, EPA is withdrawing both of the proposed treatment standards for D007 wastes (i.e., the transfer from F006 and from K062). The Agency contemplated promulgating a standard of 5.2 mg/l based on F006 treatment data, which it is even closer to the characteristic level than the 4.3 mg/l calculated using the commenters' data (i.e., CyanoKEM data and 42 data points from HWTC). The treatment standard promulgated today, therefore, is set at 5.0 mg/l chromium (total) (as measured by TCLP). While the majority of commenters supported this approach from a policy standpoint, the Agency is convinced that the available data submitted by them clearly indicate the validity of the achievability of this standard.

The commenter pointed out that other commenters supported their position that the proposed treatment standards of 0.094 mg/l for D007 nonwastewaters should be raised. The Agency acknowledges that it is true that the commenters (identified below) all expressed concern that the proposed standard of 0.094 mg/l for D007 nonwastewaters were unachievable. However, CyanoKEM was the only commenter who believed (as HWTC does) that the D007 nonwastewater standard should be in the range of 0.3 to 0.7 mg/l. The following is a summary of the positions held by the other commenters that the HWTC is referring to:

Tricil Corporation submitted comments and D007 treatment data under Docket number LD12-00094. Tricil stated that the D007 nonwastewater standard should be 5.2 mg/l based on the F006 treatment data. The Agency notes that Tricil, a member of the treatment industry, rejects certain

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waste streams as untreatable due to the presence of complexing agents and high concentrations of chromium in excess of 10,000 ppm. Although, these data were lacking in information, if they were used to calculate a treatment standard it would have been 12.0 mg/l for D007 nonwastewaters.

Chemfix submitted comments and treatment data (LD12-00073) for D007 wastes. Chemfix stated that the proposed D007 nonwastewater standard could not be routinely achieved, but believes that a standard below 5.2 mg/l may be achieved. Although these data were deficient in information, if they were used to calculate a standard it would have been 0.33 mg/l (the Agency notes that this standard is based on only one datum point with untreated chromium concentrations of only 17.9 mg/kg).

Eticam submitted comments (no treatment data) under docket number LD12-00270. Eticam stated that the proposed standard of 0.094 is not achievable and that even a standard of 5.2 mg/l is difficult to achieve in some instances.

Phillips Petroleum submitted comments (no treatment data) under LD12-00080. Phillips Petroleum stated that the proposed D007 nonwastewater standard was unachievable and the Agency should set a standard of 5.2 mg/l based on the F006 data.

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American Chrome and Chemical Inc., submitted comments under LD12-00105. American Chrome & Chemicals Inc. stated that the D007 nonwastewater standard should not be regulated below the characteristic level for chromium, i.e., 5.0 mg/l TCLP leachate.

Chemicals Manufacturers Association (CMA) submitted comments and treatment data for D007 wastes. CMA stated that the proposed D007 nonwastewater treatment standard of 0.094 is unachievable and the D007 nonwastewater standard should be based on F006 data i.e., 5.2 mg/l. The CMA data were deficient in criteria meeting the BDAT data quality, however, if these data were used to calculate a standard, the data would have produced a standard of 10 mg/l.

Finally, with respect to the Chemical Manufactures Association data, these data were deficient in many criteria for BDAT data quality, i.e., no untreated data (total or TCLP) and no Quality Assurance/Quality Control (QA/QC) data. Although these data do not meet the criteria for BDAT quality, if they were used to develop a treatment standard it would have been 20 mg/l before accuracy-correction factors are applied. The Agency does not believe that based on the above-mentioned discussion of comments and treatment data that this is supportive of keeping the D007 nonwastewater standard below 1 ppm (as cited by the commenter).